

# NEW PHOTOMETRICALLY VARIABLE MAGNETIC CHEMICALLY PECULIAR STARS IN THE ASAS-3 ARCHIVE

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## ABSTRACT

The magnetic Ap or CP2 stars are natural atomic and magnetic laboratories and ideal testing grounds for the evaluation of model atmospheres. CP2 stars exhibiting photometric variability are traditionally referred to as  $\alpha^2$  Canum Venaticorum (ACV) variables. Strictly periodic changes are observed in the spectra and brightness of these stars, which allow the derivation of rotational periods. Related to this group of objects are the He-weak (CP4) and He-rich stars, some of which are also known to undergo brightness changes due to rotational modulation. Increasing the sample size of known rotational periods among CP2/4 stars is an important task, which will contribute to our understanding of these objects and their evolution in time. We have compiled an extensive target list of magnetic chemically peculiar (CP2/4) stars from the General Catalogue of Ap, HgMn, and Am stars. In addition to that, a systematic investigation of early-type (spectral types B/A) variable stars of undetermined type in the International Variable Star Index of the AAVSO (VSX) yielded additional ACV candidates, which were included in our sample. We investigated our sample stars using publicly available observations from the ASAS-3 archive. Our previous efforts in this respect led to the discovery of 323 variable stars in these data. Using a refined analysis approach, we were able to identify another 360 stars exhibiting photometric variability in the accuracy limit of the ASAS-3 data, thereby concluding our search for photometrically variable magnetic chemically peculiar stars in the ASAS-3 archive. Summary data, folded light curves and, if available, information from the literature are presented for all variable stars of our sample, which is composed of 334 bona-fide ACV variables, 23 ACV candidates and three eclipsing binary systems. Interesting and unusual objects are discussed in detail. In particular, we call attention to HD 66051 (V414 Pup), which was identified as an eclipsing binary system showing obvious rotational modulation of the light curve due to the presence of an ACV variable in the system.

*Keywords:* stars: chemically peculiar — stars: variables: ACV — stars: individual: V414 Pup

## 1. INTRODUCTION

Chemically peculiar (CP) stars, which comprise about 15% of the upper main sequence stars between spectral types early B to early F, are characterized by abnormal line strengths of one or several elements.

This peculiar abundance pattern is thought to be produced by selective processes (radiative levitation, gravitational settling) operating in calm radiative atmospheres (Richer et al. 2000). Evidence has accumulated that there is no clear boundary between normal and CP

stars but rather a smooth transition in regard to peculiarity (Lodén & Sundman 1987). Furthermore, the CP phenomenon is not restricted to a particular evolutionary stage (Kochukhov & Bagnulo 2006). Preston (1974) divided the CP stars into the following four subgroups: CP1 stars (the metallic line or Am/Fm stars), CP2 stars (the magnetic Bp/Ap stars), CP3 stars (the HgMn stars) and CP4 stars (the He-weak stars). Further groups of CP stars were subsequently defined, like e.g. the He-strong stars (Berger 1956; MacConnell et al. 1970) or the  $\lambda$  Bootis stars (Parenago 1958; Paunzen 2004).

The CP2 stars differ from the CP1 and CP3 objects in that they possess globally organized magnetic fields from about 300 G to several tens of kiloGauss (Aurière et al. 2007; Kochukhov 2011), which also holds true for the CP4 objects. CP2 stars show a nonuniform distribution of chemical elements, which manifests itself in the formation of spots and patches of enhanced element abundance (Michaud et al. 1981), in which flux is redistributed through bound-free and bound-bound transitions (e.g. Krtićka et al. 2013). Therefore, as the star rotates, strictly periodic changes are observed in the spectra and brightness of many CP2 stars, which are satisfactorily explained by the oblique rotator model (Stibbs 1950). CP2 stars exhibiting photometric variability are traditionally referred to as  $\alpha^2$  Canum Venaticorum (ACV) variables (Samus et al. 2007 – 2016).

CP3 stars do not show strong large-scale organized magnetic fields, and the discussion about the presence of tangled magnetic fields is ongoing (e.g. Kochukhov et al. 2013). However, the line-profile variations detected in the spectra of these stars have also been interpreted in the terms of abundance inhomogeneities (Adelman et al. 2002; Hubrig et al. 2006). Therefore, rotationally induced photometric variability at some level would be expected. While photometric variations in CP3 stars have been established beyond doubt, the underlying mechanism is still a matter of debate (e.g. Morel et al. 2014). However, rotational modulation due to surface spots in CP3 stars is believed to produce only marginal photometric amplitudes (Paunzen et al. 2013), which can likely be studied with high-precision (space) photometry only. In the preparatory stage of our investigation, some CP3 stars were checked for light variability in ASAS-3 data, albeit with null results, which substantiates this assumption. However, this question is beyond the scope of the present investigation, which concentrates on the classical magnetic CP2/4 stars.

CP2 stars are natural atomic and magnetic laboratories and, because of their unusual abundance patterns, ideal testing grounds for the evaluation of model atmospheres (Krtićka et al. 2009). Increasing the sample of known CP2 stars is therefore an important task

considerable effort has been devoted to in the past (Manfroid & Mathys 1986; Paunzen & Maitzen 1998; Paunzen et al. 2011; Wraight et al. 2012).

Our own efforts in this respect (Bernhard et al. 2015a,b) have produced extensive lists of new ACV variables and candidates that have been found by an investigation of publicly available sky survey data. Bernhard et al. (2015a, Paper 1 hereafter) investigated the photometric variability of Ap stars using observations from the third phase of the All Sky Automated Survey (ASAS-3, Pojmański 2002) and identified 323 variable stars (mostly ACV variables), 246 of which were reported as variable objects for the first time. As an expansion of this work, we here report on the discovery of an additional 360 variable stars in ASAS-3 data which have been found by a refined analysis approach. In agreement with our expectations, the new sample is also composed mostly of bona-fide ACV variables.

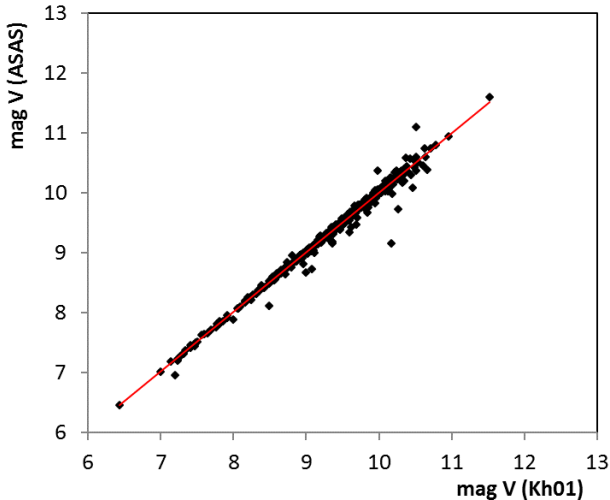
Observations and target selection are described in Section 2, data analysis and classification in Section 3. Results are presented and discussed in Section 4, and we conclude in Section 5.

## 2. OBSERVATIONS AND TARGET STARS

### 2.1. Characteristics of ASAS-3 data

The aim of the All Sky Automated Survey (ASAS) is the detection and investigation of any kind of photometric variability. To this end, ASAS constantly monitored the entire southern sky and part of the northern sky to about  $\delta < +28^\circ$ . The third phase of the project, ASAS-3, lasted from 2000 until 2009 (Pojmański 2002). The employed instrumentation, which was situated at the 10-inch astrograph dome of the Las Campanas Observatory in Chile, consisted of two wide-field telescopes equipped with f/2.8 200 mm Minolta lenses and 2048 x 2048 AP 10 Apogee detectors that covered a field of sky of  $8.8^\circ \times 8.8^\circ$ . About  $10^7$  sources brighter than  $V \approx 14$  mag were monitored in Johnson V. The achieved CCD resolution was about  $14.8''$  / pixel, which led to an astrometric accuracy of around  $3 - 5''$  for bright stars and up to  $15.5''$  for fainter stars. As a result, photometry in crowded fields, as in star clusters, is rather uncertain. A field was typically observed every one, two or three days (Pigulski 2014). This observing cadence results in strong daily aliasing and renders the interpretation of the resulting Fourier amplitude spectra ambiguous.

The ASAS-3 archive contains reasonable photometry for stars in the magnitude range  $7 \lesssim V \lesssim 14$ . However, the most accurate data were obtained for targets in the magnitude range  $8 \lesssim V \lesssim 10$ . Here, the typical scatter is about 0.01 mag (e.g. Pigulski 2014). However, because of the long time base of almost ten years, ASAS-3 data allow for the detection of periodic signals with very small



**Figure 1.** Comparison between mean ASAS-3  $V$  magnitudes and  $V$  magnitudes given by Kharchenko (2001) for the stars of our final sample.

amplitudes. For instance, David et al. (2014) identified periodic variables with a range of variability of  $0.01 - 0.02$  mag in the magnitude range of  $7 \lesssim V \lesssim 10$ . Pigulski (2014) estimated that periodic signals with amplitudes as low as about 5 millimag (mmag) can be detected.

Pojmański (2002) has shown that the zero-points of the ASAS-3 and Hipparcos photometry agree to within about  $\pm 0.015$  mag for stars lying close to the frame center. However, flat-fielding issues, missing color information and blending may result in much larger differences. We have investigated the agreement between mean ASAS-3  $V$  magnitudes and  $V$  magnitudes given by Kharchenko (2001) for the stars of our final sample. The results are shown in Figure 1 and indicate very good general agreement between both sources. In most cases, unresolved close companions are responsible for the observed discrepancies.

## 2.2. Target Stars

An initial list of target stars was created by selecting CP2 stars or CP2 star candidates and He-weak (CP4) / He-strong objects from the most recent version of the Catalogue of Ap, HgMn, and Am stars (Renson & Manfroid 2009, RM09 hereafter). Objects in the RM09 catalogue are not explicitly subdivided according to the classification established by Preston (1974). We therefore resorted to the listed spectral types to distinguish between the different groups of CP stars (mainly denoted as Si, Sr, Sr Eu Si, He weak, Hg Mn, and so on). The resulting list of stars was cross-matched with the Tycho-2 catalogue (Høg et al. 2000); unlike our initial approach, where we defined a cut-off at  $V_T < 11$  mag (cf. Paper 1, section 2), no brightness limit was imposed.

In addition to that, a systematic investigation of early-type (spectral types B/A) variable stars of undetermined type in the AAVSO International Variable Star Index (VSX; Watson 2006) yielded additional ACV candidates, which were added to our target list.

We consulted the GCVS (Samus et al. 2007 – 2016), VSX, SIMBAD (Wenger et al. 2000) and VizieR (Ochsenbein et al. 2000) databases in order to check for an entry in variability catalogues and to collect literature information on our target stars. Known ACV variables with well determined parameters were dropped from our sample; suspected or misclassified variables and variables of undetermined type were kept.

## 3. DATA ANALYSIS AND CLASSIFICATION

### 3.1. Data Processing and Period Analysis

The light curves of our sample stars were downloaded from the ASAS-3 website<sup>1</sup>. For the present investigation, a refined analysis approach was developed with the intention of discovering variable objects that might have been missed by the imposed criteria in our previous work (Paper 1). In order to retain as many objects as possible, no lower limit was imposed on the number of observations in the ASAS-3 archive. In Paper 1, we restricted our analysis to promising candidates in order to keep our sample down to a manageable size. As promising candidates, we defined stars showing a larger scatter than usually observed for apparently constant stars in the corresponding magnitude range with comparable instruments (Hartman et al. 2004). No such criteria were imposed in the present investigation; instead, every individual ASAS dataset was roughly cleaned of outliers and searched for periodic signals in the frequency domain of  $0 < f$  (cycles per day; c/d hereafter)  $< 20$  using PERIOD04 (Lenz & Breger 2005).

Furthermore, the periodicity detection threshold was lowered significantly. Only objects with semi-amplitudes of  $\gtrsim 0.007$  mag (as derived with PERIOD04) were considered in Paper 1. In the present investigation, all objects exhibiting variability with a semi-amplitude of at least 0.004 mag were subjected to a more detailed analysis. This limit is an experiential value based on our own extensive experience in dealing with the ASAS-3 data and the results of David et al. (2014) and Pigulski (2014). It was chosen as a compromise between retaining variables with small amplitudes and eliminating spurious detections.

In the next step of analysis, left-over data points with a quality flag of 'D' (= 'worst data, probably useless') were rejected and remaining outliers were care-

<sup>1</sup> <http://www.astrouw.edu.pl/asas/>

fully removed by visual inspection. Furthermore, the data were checked for the presence of systematic trends. These were mostly due to strong blending effects which might result in significant additional scatter due to the inclusion of part of a neighbouring star's flux (Sitek & Pojmański 2014) or instrumental long-term trends that could introduce spurious signals into the data. Depending on the severity of artifacts, the affected datasets were either rejected or the trends were removed.

To refine the initial frequency analysis, the pretreated datasets were again searched for periodic signals in the frequency domain of  $0 < f \text{ (c/d)} < 10$  with PERIOD04. The data were folded on the resulting best fitting frequency and visually inspected. Objects exhibiting convincing phase plots were kept.

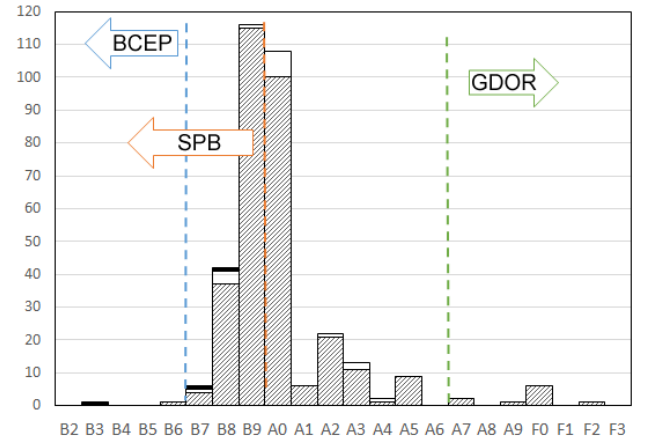
The light curves of CP2 stars can be well described by a sine wave and its first harmonic (North 1984; Mathys & Manfroid 1985; Heck et al. 1987; Bernhard et al. 2015b). We performed a least-squares fit to the data using PERIOD04. Each light curve was fitted using a Fourier series consisting of the fundamental sine wave and its first harmonic, from which the light curve parameters (semi-amplitudes  $A_1$ ,  $A_2$ , and the corresponding phases  $\phi_1$ ,  $\phi_2$ ) were derived.

As pointed out, the light curves of most ACV variables are sinusoidal. In orientations where two photometric spots of overabundant optically active elements come into view during a single rotation cycle, the light curve becomes a double wave (Maitzen 1980). If the two spots are of similar extent and photometric properties, the resulting 'maxima' will be of approximately the same height. Therefore, a twice longer (or shorter) rotation period cannot be excluded. This holds especially true for objects with very small amplitudes and/or significant scatter in their light curves.

In addition to that, alias periods cannot be totally excluded because of the strong daily aliasing inherent to ASAS-3 data (cf. section 2.1). However, we have checked the period solution of all doubtful cases and are confident that we have come up with the period that fits ASAS-3 data best. This assumption is further corroborated by the generally very good agreement of our period solutions to those from the literature (cf. also Paper 1).

### 3.2. Classification

For the final classification, all available information (spectral type, colour indices, period, shape of the light curve, Fourier amplitude spectrum) was taken into account. Except for the eclipsing binary systems (see below), all stars in our final sample exhibit a variability pattern that is in general accordance with rotational modulation caused by spots. HD 66051 (V414 Pup)



**Figure 2.** Distribution of spectral types among the stars of our final sample. Only stars with accurate spectral classifications have been considered. Confirmed CP stars are indicated by the hatched area. The white and black areas denote, respectively, CP star candidates and CP4 / He-strong stars. The approximate loci of some important groups of early-type pulsating variables are indicated.

is a special case in that it clearly shows both orbital (eclipses) and rotational modulation.

However, caution has to be taken, as it is not straightforward to distinguish between variability induced by rotation and other sources like e.g. pulsation or orbital motion. This holds especially true when analysing variable stars whose photometric amplitudes are near the detection limit of the employed data, as is the case for many of our targets.

Pulsation as the underlying mechanism of the observed variability can be ruled out for most objects of our sample on the following grounds. The vast majority of our sample stars is found between spectral types B7 to A5 (see Figure 2). Therefore, pulsators that are exclusively found among earlier spectral types, like e.g.  $\beta$  Cephei variables (GCVS-type BCEP, spectral types  $\sim$ O8–B6), or primarily among later spectral types, as e.g. the  $\gamma$  Doradus stars (GCVS-type GDOR, spectral types  $\sim$ A7–F7), are not expected to contribute much to our sample. Of course, inaccuracies / difficulties in spectral classification have to be considered, and the spectral types shown in Figure 2 might be uncertain by several subclasses.

Furthermore, our target stars exhibit photometric periods longer than  $P > 0.5$  days. We can thus exclude the presence of  $\delta$  Scuti variables (GCVS-type DSCT) or other short period pulsators.

On the other hand, some types of pulsating variables partly overlap with ACV stars in respect to spectral type and period. The so-called slowly pulsating B (GCVS-type SPB) stars, for instance, are encountered down to spectral type B9 (Figure 2) and exhibit periods between



about 0.4 to 5 days. The  $\gamma$  Doradus stars are found between spectral types A7 to F7; observed periods usually range from 0.3 to 3 days.

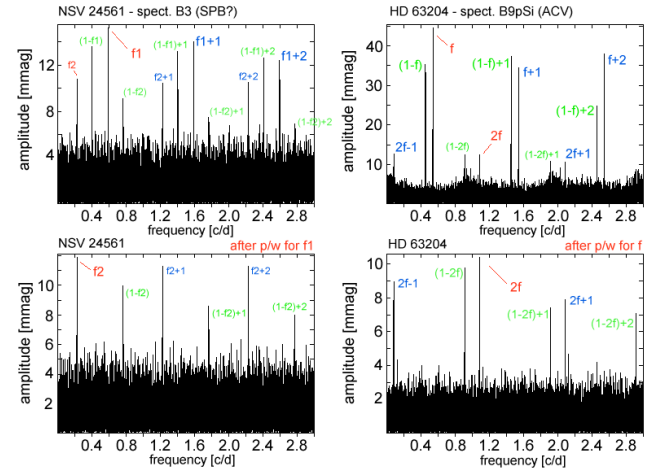
One way of distinguishing these types of variable stars is an investigation of their Fourier amplitude spectra. Many kinds of pulsators, like e.g. SPB and  $\gamma$  Doradus stars, show multiple periods and quite different frequency spectra from rotating variables. For instance, harmonics of pulsation modes are only expected to be present in frequency spectra when the amplitude is large. On the other hand, harmonics are a consequence of localized spots and a characteristic of the frequency spectra of rotating variables (Balona et al. 2015).

Spots form and decay in late-type, active stars, and differential rotation might lead to the presence of multiple, closely-spaced periods in these objects (Reinhold & Gizon 2015). However, the presence of starspots in stars with radiative envelopes, like B/A stars, is still a matter of some controversy. Recently, Balona and coworkers have collected evidence that A-type stars are active and show starspots in the same way as their cooler counterparts (e.g. Balona 2013). Nevertheless, the spots on CP2 stars are of a different nature (abundance patches) and constitute durable configurations that remain stable for decades, probably as a consequence of strong magnetic fields.

Differential rotation, however, plays an important role in A-type stars (Ammler-von Eiff & Reiners 2012; Szklarski & Arlt 2013; Balona & Abedigamba 2016). However, to our knowledge, no study of the possible effects of differential rotation on CP2 star light curves exists. Judging from the stability of the periods and light curves among ACV variables, we assume that these effects, if present, are generally small. However, it must not be dismissed that the presence of multiple, closely-spaced frequencies in the Fourier amplitude spectra of early-type stars might be due to differential rotation and need not automatically imply pulsation. Apart from this special scenario, however, the presence of multiple periods is not to be expected in CP2 stars and interpreted by us as an indication of pulsation in a non-CP2 star as the underlying mechanism of the observed photometric variability.

Figure 3 shows the Fourier amplitude spectra of two B-type stars and illustrates the described differences in the frequency spectra between a multi-periodic, pulsating variable (NSV 24561, spectral type B3, likely an SPB star) and a rotating variable (HD 63204, spectral type B9pSi, a confirmed ACV variable, cf. Bernhard et al. 2015a). No harmonics are seen in the spectrum of NSV 24561, which exhibits two significant low frequencies. In contrast, only one frequency and its first harmonic are present in the frequency spectrum of HD 63204.

It has to be kept in mind, though, that these assump-



**Figure 3.** Fourier amplitude spectra of a multi-periodic, pulsating variable (NSV 24561, spectral type B3, likely an SPB star; left panels) and a rotating variable (HD 63204, spectral type B9pSi, a confirmed ACV variable; right panels). The plots have been based on unwhitened ASAS-3 data (upper panels) and ASAS-3 data that have been prewhitened with, respectively,  $f_1$  and  $f$  (lower panels). Significant frequencies are indicated in red. The corresponding  $(f + 1)$  and  $(1 - f)$  aliases are indicated, respectively, in blue and green.

tions are simplifications that do not represent Nature with all its intricacies. For instance, recent evidence from Kepler data indicates that rotational frequencies might possibly be present in SPB variables and result in the presence of harmonics in the corresponding Fourier amplitude spectra (Balona et al. 2015).

Finally, and most importantly, the spectra of all these kinds of pulsating variables are not characterized by the abnormal abundance patterns of the CP2/4 stars, which are a confirmed characteristic of most of our target stars and are expected for the CP2 star candidates in our sample. Generally, pulsation is not to be expected in CP2 stars. The only proven form of pulsational variability among this type of CP stars is observed in the so-called rapidly oscillating Ap (roAp) stars (Kurtz 1982) which exhibit photometric variability in the period range of 5–20 min (high-overtone, low-degree, and non-radial pulsation modes). This is very different from what has been observed for our sample stars. We therefore feel confident in ruling out pulsation as the underlying cause of the observed photometric variability in most of our sample stars.

The discrimination between rotational modulation and variability induced by orbital motion (as observed in ellipsoidal variables, GCVS-type ELL, and eclipsing binaries) is more difficult, though. Generally, it is not possible to distinguish between both types of variations without additional spectroscopic information (Paper 1; Balona et al. 2015). For some CP stars, for instance, a double-wave structure of the photometric light curve has

been observed (Maitzen 1980). The light curves of these ‘double-humped’ ACVs are not to be distinguished from the light curves of ellipsoidal variables on grounds of single-passband photometric data alone. However, it has been shown that the incidence of ellipsoidal or eclipsing variables among CP2 stars is very low (Gerbaldi et al. 1985; North & Debernardi 2004; Hubrig et al. 2014) and even in a sample of some hundred stars, only very few ellipsoidal or eclipsing variable star candidates are to be expected (cf. Paper 1).

We have identified three eclipsing binary stars among our targets (CPD-20 1640, HD 66051, and HD 149334, cf. section 4). While the system of HD 66051 (V414 Pup) definitely hosts a CP2 star, the CP classification of the other two objects is doubtful; thus, spectroscopic investigations are needed to confirm or reject the assumed presence of a CP2 star in these systems. Furthermore, with the available data, we are not able to distinguish between rotational and orbital modulation as the underlying cause of the photometric variability of the CP4 star HD 161733A. Section 4.2 provides a detailed discussion of these objects.

Before the background of the characteristic light variations and Fourier amplitude spectra, the confirmed CP2/4 nature of our targets, and the available spectral classifications, which go along well with the observed colour indices, the most likely explanation of the observed light variations in the majority of our sample stars is the redistribution of flux in spots of overabundant optically active chemical elements. We are therefore confident that most of the confirmed CP2/4 stars in our sample are bona-fide ACV variables ( $N = 334$ ). The few exceptions or special cases are commented on in section 4.2.

This assumption is further corroborated by the fact that (with the exception of the eclipsing binaries) all light curves of our sample stars can be well represented by a sine wave and its first harmonic - a procedure which has been shown to adequately describe the light curves of ACV variables (cf. section 3.1). The photometrically variable CP2 star candidates in our sample are here proposed as ACV variable candidates (type ACV: in Table 2;  $N = 23$ ) on grounds of their periods and typical photometric variability but need spectroscopic confirmation of their CP status. The two CP4 objects and the He-strong star are also designated as ACV candidates, as other mechanisms beside rotational modulation might be at work in these objects (section 4.2).

## 4. RESULTS

### 4.1. Presentation of Results

Employing the methodology outlined above (sections 2 and 3), 360 stars exhibiting photometric variability in

**Table 1.** Statistical information on the composition of the final sample.

Type	Number of objects
ACV variables	334
ACV variable candidates	23
eclipsing binary systems	3
total of variable stars	360

the accuracy limit of the ASAS-3 data were identified among the stars of our target list. We have ruled out pulsation as the underlying mechanism of the observed variability in most of our targets and are confident of the applicability of our classifications. Table 1 gives statistical information on the composition of the final sample.

We have searched the SIMBAD, VizieR, and VSX databases for previously published information on our targets. According to these sources, most of the investigated CP stars have never been the subject of a light variability analysis before and are here presented as variable stars for the first time. Some of our target stars have been previously investigated and found constant or probably constant; other objects have been identified as variable stars with or without a given period in the literature, but their variability types have not been determined or they have been misclassified.

Table 2 presents essential data and light curve fit parameters for our sample stars and is organized as follows:

- Column 1: star name, HD number, or other conventional identification.
- Column 2: identification number from RM09.
- Column 3: right ascension (J2000; Tycho-2).
- Column 4: declination (J2000; Tycho-2).
- Column 5: variability type, according to GCVS convention (ACV / ACV: / EA).
- Column 6:  $V$  magnitude range, as derived from the Fourier fit to the ASAS-3 data.
- Column 7: period (d).
- Column 8: epoch (HJD-2450000); time of maximum is indicated for ACV variables or candidates, time of minimum for the eclipsing binary systems.
- Column 9: Semi-amplitude of the fundamental variation ( $A_1$ ).<sup>2</sup>

<sup>2</sup> Columns 8–11 have only been calculated for ACV variables or candidates. In the case of HD 66051 (V414 Pup), the corresponding values have been calculated from a fit to the out-of-eclipse, rotationally induced variability (cf. section 4.2.2).

- Column 10: Semi-amplitude of the first harmonic variation ( $A_2$ ).
- Column 11: Phase of the fundamental variation ( $\phi_1$ ).<sup>3</sup>
- Column 12: Phase of the first harmonic variation ( $\phi_2$ ).
- Column 13: Spectral classification, as listed in RM09; it is noteworthy that, as in the original catalogue, the 'p' denoting peculiarity has been omitted from the spectral classifications taken from RM09. For the five stars not included in this catalogue, the spectral types have been gleaned from the VSX and verified using the VizieR and SIMBAD catalogue services.
- Column 14: ( $B-V$ ) index, taken from [Kharchenko \(2001\)](#).
- Column 15: ( $J - K_s$ ) index, as derived from the 2MASS catalogue ([Skrutskie et al. 2006](#)).

The light curves of all objects, folded with the periods listed in Table 2, are presented in the Appendix (Figure 8).<sup>4</sup> Information from the literature and miscellaneous remarks on individual objects are listed in Table 3, which is organized as follows:

- Column 1: star name, HD number, or other conventional identification.
- Column 2: variable star designation from the literature.
- Column 3: variable star type from the literature.
- Column 4: period (d) from the literature.
- Column 5: period (d) from this work.
- Column 6: reference in which, to the best of our knowledge, the object has been announced as a variable star for the first time.
- Column 7: remarks / comments of a miscellaneous nature; an asterisk denotes stars, whose status as chemically peculiar objects is doubtful according to RM09.

<sup>3</sup> The calculation of the phase values has been based on the times of observations as provided by the ASAS-3 database, i.e. HJD-2450000.

<sup>4</sup> Only part of Figure 8 is included; the complete figure is available from the authors.

Both tables are listed in their entirety in the Appendix. We are currently working on a statistical paper on the properties of ACV variables, which will include results from the literature as well as our own investigations (Paper 1, [Bernhard et al. 2015b](#), this paper). Therefore, in the present work, we restrict ourselves to the discussion of interesting and unusual objects.

#### 4.2. Notes on Individual Objects

The following sections contain notes and literature information on several unusual and interesting objects.

##### 4.2.1. CPD-20 1640 = NGC 2287 40

CPD-20 1640 is listed with a spectral type of A5pSiSr in the RM09 catalogue. It has been identified with Cox 40 (=NGC 2287 40) and is likely a member of the intermediate-age open cluster NGC 2287 ([Landstreet et al. 2007](#)). However, its status as a CP2 star needs confirmation. While the listed spectral type is in accordance with this classification, it is not supported by the measured  $\Delta a$  and  $Z$  values and the non-detection of a magnetic field (cf. [Landstreet et al. 2007](#), and references therein).

ASAS-3 data indicate that CPD-20 1640 is an eclipsing binary with a period of  $P = 2.43400(2)$  d. The primary minimum is sharp and suggestive of a detached or semi-detached system (cf. Figure 4). If proven that at least one component of this system is indeed a classical CP2 star, CPD-20 1640 would be of high interest, as the incidence of CP2 stars in eclipsing binaries is very low (cf. section 3.2). RM09 list only five candidates for eclipsing CP2 stars; only one (AO Velorum) has been confirmed ([González et al. 2006](#)). Another confirmed eclipsing CP2 star (HD 66051) is presented in the following section. One good candidate (HD 70817) and three possible candidates were identified in Paper 1 but need spectroscopic confirmation. We therefore strongly encourage further studies of CPD-20 1640 in order to confirm or reject the assumed presence of a CP2 star in the system.

##### 4.2.2. HD 66051 = V414 Pup

HD 66051 is a confirmed CP2 star of the Silicon subgroup ([Bidelman & MacConnell 1973](#); [Houk & Smith-Moore 1988](#)) and listed with a spectral type of A0pSi in the RM09 catalogue. Its photometric variability was discovered in Hipparcos data (HIP 39229; [van Leeuwen et al. 1997](#)). The star was subsequently included in the GCVS as an ACV candidate (type ACV:); no period or epoch were given.

The star was discovered to be an eclipsing binary of Algol-type (GCVS-type EA) by [Otero \(2003\)](#), who derived an orbital period of  $P = 4.74922$  d and a magnitude range of 8.79–9.12 mag ( $V$ ) from a combination of

**Table 2.** Essential data for the stars identified as photometrically variable chemically peculiar stars or candidates in the present paper. Only part of the table is printed here for guidance regarding its form and content. The complete table is given in the Appendix.

Star	ID (RM09)	$\alpha$ (J2000)	$\delta$ (J2000)	Type	Range (V)	Period	Epoch (HJD)	$A_1$	$A_2$	$\phi_1$	$\phi_2$	Spectral type	(B - V)	(J - K <sub>s</sub> )
					[mag]	[d]	[d]	[mag]	[mag]	[rad]	[rad]		[mag]	[mag]
HD 2957	760	00 32 44.08	-13 29 13.5	ACV	8.48-8.51	4.6327(3)	4627.91(9)	0.011	0.002	0.846	0.750	B9 Cr Eu	+0.052	-0.017
HD 3885	1050	00 41 18.31	-19 51 45.9	ACV	9.79-9.81	1.81508(4)	2910.72(4)	0.007	0.009	0.348	0.449	B9 Si	-0.090	-0.079
HD 5823	1540	00 59 39.29	-11 56 01.2	ACV	9.95-9.97	1.24520(2)	3765.53(2)	0.007	0.004	0.723	0.646	F2 Sr Eu Cr	+0.304	+0.176
HD 8783	2110	01 24 00.43	-72 19 27.9	ACV	7.80-7.82	19.396(5)	3794.5(4)	0.009	0.001	0.102	0.715	A2 Sr Eu Cr	+0.150	+0.039
HD 12559		02 03 29.36	+18 19 39.4	ACV:	8.41-8.44	4.0358(3)	3338.62(8)	0.010	0.012	0.479	0.293	A2	+0.092	-0.034
HD 16145	4060	02 35 04.20	-17 17 22.3	ACV	7.64-7.67	2.23766(7)	4525.52(4)	0.011	0.002	0.342	0.873	A0 Cr Sr Eu	+0.117	-0.023
HD 20505	5120	03 15 03.18	-59 11 36.1	ACV	9.88-9.90	2.04401(5)	2666.49(4)	0.009	0.002	0.222	0.726	A2 Cr Sr	+0.120	+0.001
HD 22032	5540	03 33 11.64	+04 40 13.3	ACV	9.05-9.07	4.8589(3)	3031.57(9)	0.010	0.001	0.839	0.523	A3 Sr Eu Cr	+0.455	+0.056
HD 23509	6020	03 41 29.82	-66 28 37.9	ACV:	7.75-7.78	1.48786(3)	3010.64(3)	0.012	0.002	0.302	0.426	A3	+0.309	+0.167
HD 27210	6960	04 15 22.02	-51 44 27.1	ACV:	10.09-10.12	1.01438(1)	3447.55(2)	0.015	0.000	0.120	-	A0	+0.064	-0.046
HD 28238	7210	04 27 35.96	+06 36 43.2	ACV	9.11-9.12	24.743(7)	2676.5(5)	0.007	0.001	0.615	0.177	A0 Sr Cr Eu	+0.241	+0.053
HD 30374	7830	04 39 01.57	-75 06 10.1	ACV	10.02-10.04	1.55631(3)	3018.65(3)	0.008	0.003	0.097	0.580	A0 Sr Eu Cr	+0.105	+0.081
HD 240563	8310	05 04 57.34	+08 50 05.6	ACV	10.09-10.12	2.9447(1)	4399.78(6)	0.015	0.003	0.646	0.601	A3 Sr	+0.216	+0.078
HD 245155	9662	05 35 42.79	+25 16 29.4	ACV	9.67-9.69	0.705370(7)	3730.62(1)	0.009	0.001	0.809	0.251	B9 Si Sr	+0.080	+0.109
HD 38417	10330	05 38 55.39	-71 38 20.1	ACV	9.61-9.63	2.16619(6)	3086.56(4)	0.002	0.008	0.096	0.011	A0 Sr	+0.121	+0.044
HD 38912	10450	05 49 13.10	+01 27 30.2	ACV	9.46-9.49	1.46279(2)	2539.74(3)	0.013	0.003	0.608	0.148	B8 Si	+0.266	+0.106
HD 39082	10500	05 50 23.85	+04 57 24.3	ACV	7.41-7.42	0.764776(7)	4877.58(2)	0.007	0.001	0.045	0.341	B9 Sr Cr Eu	+0.039	-0.041
HD 40071	10680	05 56 06.12	-13 08 07.2	ACV	8.06-8.08	1.98735(5)	4477.82(4)	0.005	0.005	0.744	0.369	B9 Si	-0.042	-0.062
HD 40383	10780	05 58 37.50	+04 29 33.6	ACV	8.98-9.00	4.0364(3)	3644.86(8)	0.009	0.007	0.739	0.771	B9 Si	+0.215	+0.059
HD 40678	10876	06 01 29.21	+23 42 14.2	ACV	7.37-7.39	22.029(6)	2678.2(4)	0.012	0.001	0.238	0.541	A0 Si Sr	+0.158	-0.085

**Table 3.** Relevant information on single objects from the literature and miscellaneous remarks. An asterisk in column 7 ('Remarks/comments') denotes stars whose status as chemically peculiar objects is doubtful according to RM09. The following abbreviations are employed in column 7: R12 = [Rimoldini et al. \(2012\)](#); W12 = [Wraight et al. \(2012\)](#). Only part of the table is printed here for guidance regarding its form and content. The complete table is given in the Appendix.

Star	Var. desig.	Var. type	Period (d)	Period (d)	Reference	Remarks/comments
	Literature	Literature	Literature	This work		Literature
HD 2957				4.6327(3)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 3885	NSV 15149	VAR		1.81508(4)	<a href="#">Wesselius et al. (1982)</a>	
HD 5823				1.24520(2)		Null result for roAp pulsations ( <a href="#">Kochukhov et al. 2013</a> ).
HD 8783	SMC V2339	VAR:	21(or 1.05)? (GCVS)	19.396(5)	GCVS	Non-member of the SMC according to the GCVS. The given period values are derived from variations of the peculiarity index ?a.
HD 12559	HIP 9602	VAR	2.01833 (VSX); 2.01837 (R12)	4.0358(3)	<a href="#">Koen &amp; Eyer (2002)</a>	R12: SPB/ACV (prob: 0.24/0.51)
HD 16145			2.24(or 4.47)? (RM09)	2.23766(7)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 23509	HIP 17239	VAR	1.48779 (VSX); 1.48765 (R12)	1.48786(3)	<a href="#">Koen &amp; Eyer (2002)</a>	R12: SPB/DSCTC (prob: 0.23/0.33)
HD 27210				1.01438(1)		*
HD 240563				2.9447(1)		*
HD 245155				0.705370(7)		Constant or quality of data prevented detection (W12).
HD 38417				2.16619(6)		*
HD 39082	NSV 16689	VAR	0.76484 (VSX)	0.764776(7)	<a href="#">Vogt &amp; Faundez (1979)</a>	
HD 40678				22.029(6)		Constant or quality of data prevented detection (W12).
BD-06 1402	HIP 28864	VAR	1.13065 (VSX)	1.13063(2)	<a href="#">Koen &amp; Eyer (2002)</a>	R12: EB/SPB (prob: 0.15/0.57)
	ASAS J060540-0603.2	DCEP-FU/MISC	1.13058 (R12)			<a href="#">Richards et al. (2012)</a> : ACV (prob: 0.8109)
HD 41869				5.2350(4)		Constant or probably constant, blend? in STEREO data (W12).
HD 46105	NSV 16891	VAR		0.793263(8)	<a href="#">Rufener &amp; Bartholdi (1982)</a>	
HD 46649				4.1792(3)		RM09: A0 Si Cr ? *
HD 49797				1.22649(2)		*
HD 50031				2.8743(1)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 51342				1.43601(2)		*

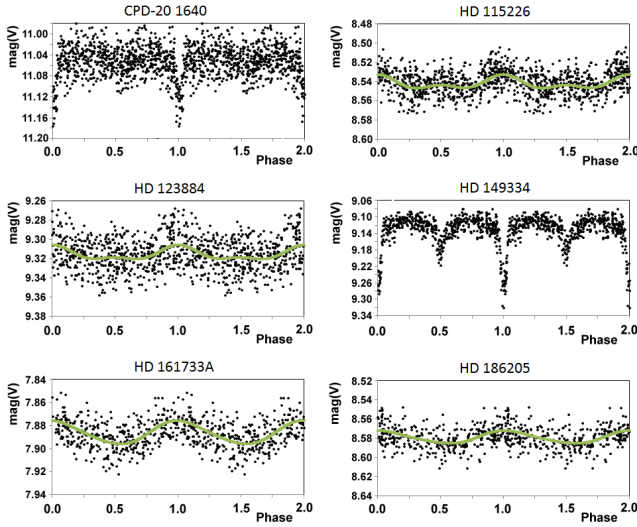
Hipparcos and ASAS-3 data. Furthermore, the star was shown to exhibit additional variability with an amplitude of 0.05 mag and the same period which was interpreted as being due to 'ACV variations', i.e. rotationally induced variability caused by surface inhomogeneities on (at least) one of the system's components.

No further detailed studies of HD 66051 exist in the VizieR and SIMBAD databases. However, a high resolution spectrum of the star is available in the archive of the 'Variable Star One-shot Project' ([Dall et al. 2007](#)), which was taken with the HARPS instrument ([Mayor et al. 2003](#)) at the ESO La Silla Observatory in

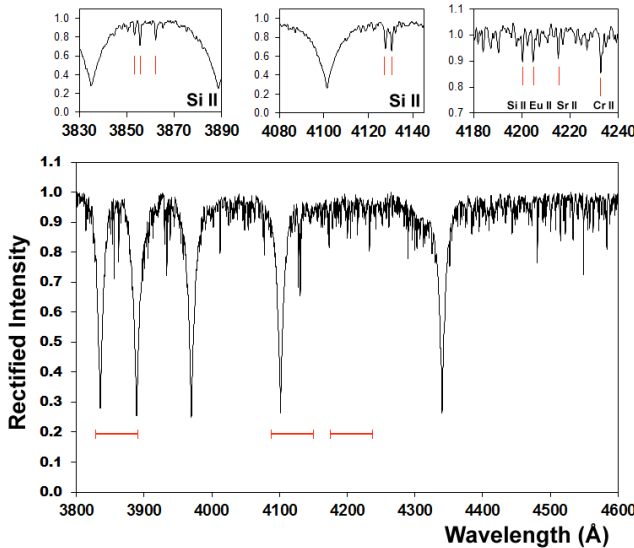
Chile. Details on the spectroscopic observation can be found in [Dall et al. \(2007\)](#). The spectrum confirms that HD 66051 harbours a CP2 Si star (cf. Fig. 5). In addition to that, enhanced lines of other elements, like e.g. Sr, Cr, and Eu, are present. The spectrum was obtained on JD 2453827.518802, which – assuming the epoch of 2452167.867 as orbital phase  $\varphi = 0$  ([Otero 2003](#)) – corresponds to  $\varphi_{\text{orb}} = 0.46$ . The spectrum does not confirm the proposed SB2 nature of the system ([Dall et al. 2007](#)), which is likely due to coverage at an 'unfortunate' orbital phase.

We have investigated the object using all available





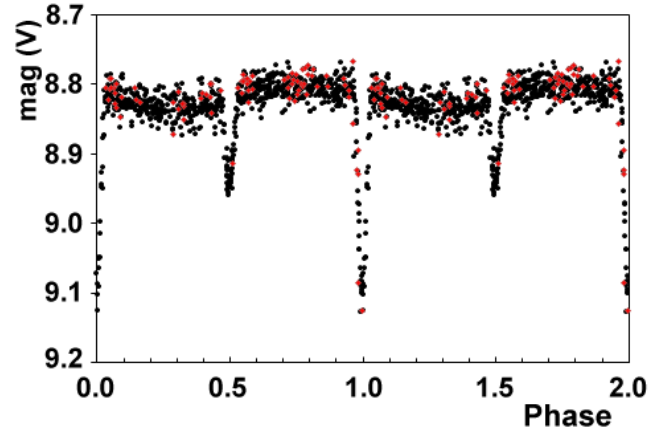
**Figure 4.** Phase plots of objects discussed in Section 4.2, based on ASAS-3 data and folded with the periods given in Table 2.



**Figure 5.** Blue-violet spectral region of HD 66051 (V414 Pup), based on the HARPS spectrum obtained by [Dall et al. \(2007\)](#). The upper panels show detailed views of regions of interest, which are indicated by the red lines in the lower panel. Some prominent lines are indicated.

data and confirm the findings of [Otero \(2003\)](#). The longevity of the observed secondary variability in the light curve, which remains stable during the  $\sim 9$  years of ASAS-3 coverage (Fig. 6), might be interpreted in terms of synchronous rotation, i.e. both stars are tidally locked.

HD 66051 is of great astrophysical interest. Firstly, the incidence of eclipsing binaries among CP2 stars is very low (cf. section 3.2). Secondly, the system is quite unique in exhibiting both eclipses and obvious ro-



**Figure 6.** Phase plot of HD 66051 (V414 Pup), based on Hipparcos data (red diamonds) and ASAS-3 data (black dots) and folded with  $P = 4.74922$  d. Hipparcos data have been transformed to the  $V$  scale following [Otero \(2003\)](#). Note the secondary variability due to the presence of a synchronously rotating ACV variable in the system. See text for details.

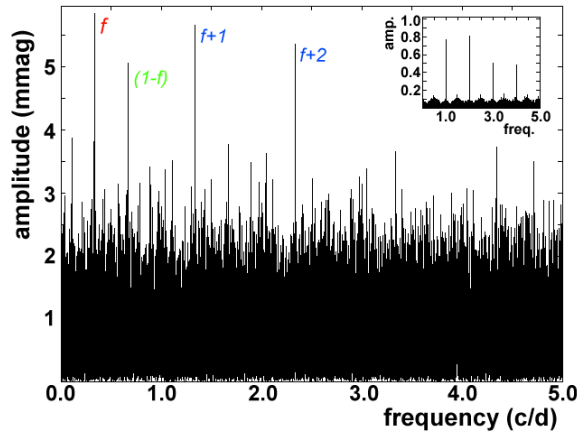
tational variability due to abundance inhomogeneities, which opens up a lot of interesting possibilities for future research. We have already embarked on a detailed study of this star, the results of which will be presented in a future publication.

#### 4.2.3. HD 115226

Using time-series spectroscopy, [Kochukhov et al. \(2008\)](#) identified HD 115226 as a rapidly oscillating Ap (roAp) star and inferred a pulsation period of 10.86 min from radial velocity variations in Pr III, Nd III, Dy III and the narrow cores of the hydrogen lines. They found  $v_e \sin i = 25\text{--}30 \text{ km s}^{-1}$  and deduced a rotational period of  $P_{\text{rot}} \leq 3.0\text{--}3.5$  d. Furthermore, they established the presence of surface abundance inhomogeneities but did not detect any significant variability in the then available data from the ASAS-3 survey. However, marginal variability with  $P = 3.61$  d and an amplitude below 0.01 mag was detected in Hipparcos data ([van Leeuwen et al. 1997](#)).

We have analyzed the available ASAS-3 data for HD 115226 and detect a clear signal at a frequency of  $f = 0.33465 \text{ c/d}$  ( $P = 2.9882(1) \text{ d}$ ), which lies well above the noise level (Fig. 7). The resulting phase plot shows a double wave which is typical of ACV variables and consistent with both magnetic poles being visible over the rotation period (Fig. 4). Furthermore, the derived period is in accordance with the above mentioned assumptions of [Kochukhov et al. \(2008\)](#).

We have investigated Hipparcos data and confirm marginal variability with  $P = 3.61$  d, as proposed by the aforementioned authors. However, this signal is not present at all in the ASAS-3 data, which boast a much



**Figure 7.** Frequency spectrum of HD 115226, based on ASAS-3 data. The main frequency and its most prominent daily aliases are identified. The inset shows the spectral window dominated by daily aliases.

longer time base ( $\sim 3000$  days) and a greater number of observations (639 measurements) than Hipparcos data ( $\sim 1250$  days; 116 measurements). We are therefore inclined to accept the period value derived from ASAS-3 data as real.

The pulsations of roAp stars are explained satisfactorily by the oblique pulsator model (Kurtz 1982; Saio 2005). Oblique pulsation results in frequency multiplets with components that are separated by the rotation frequency of the star (e.g. Takata & Shibahashi 1995). Thus, accurate knowledge of the rotation frequency is mandatory for the full interpretation of the frequency multiplets generated by the rotational modulation of the short period pulsations observed in roAp stars. The result of the present investigation will therefore provide a significant contribution to the deciphering of the frequency multiplet of the rapid, 10.86 min oscillations observed in HD 115226.

#### 4.2.4. HD 123884

RM09 indicated a spectral type of B8He wk for this high-latitude early-type star, remarking, however, that the given spectral type is only an approximation and that the object apparently shows no other than hydrogen lines. Very disparate entries are found in the Catalogue of Stellar Spectral Classifications (Skiff 2009 – 2016) which range from B4s to A0Ib?. Bidelman (1988) called attention to HD 123884 and remarked that it might not be a classical CP star but rather a post-asymptotic branch star of moderate luminosity. Querying the SIMBAD and VizieR databases, no variability studies of the object were found.

ASAS-3 data indicate a period of  $P = 1.02101(1)$  d for HD 123884. While the amplitude of variability is relatively high (0.013 mag, as derived with PERIOD04), the period value is close to one day; thus independent confir-

mation of our results are needed. However, the resulting phase plot looks convincing (Figure 4) and shows indications of a double-humped structure, which is typical for ACV variables. Further studies to confirm the proposed variability and unravel the underlying mechanism are encouraged.

#### 4.2.5. HD 149334

Bidelman & MacConnell (1973) give a spectral type of ApSr for this star, Houk (1982) – using exactly the same objective prism plates (Maitzen et al. 1997) – classified it as A9IV. Maitzen et al. (1997) found a  $\Delta a$  value of +0.011 mag for HD 149334, which is below their peculiarity threshold of  $\geq 0.014$  mag.

HD 149334 was identified as an eclipsing binary system of Algol-type (GCVS-type EA) by Sitek & Pojmański (2014), who derived a period of  $P = 3.5444$  d from ASAS *I* band data. An analysis of ASAS-3 *V* data confirms the results of the aforementioned investigators; because of the longer time base, the period could be refined to  $P = 3.54420(6)$  d (Fig. 4).

As the incidence of CP2 stars in eclipsing binaries is very low (cf. section 3.2 and section 4.2.1), HD 149334 is a potentially interesting object. However, in the light of the conflicting results mentioned above, spectroscopic confirmation of the presence of a CP2 star in the system is needed.

#### 4.2.6. HD 161733A = IC 4665 82

This star, which is likely a member of the open cluster IC 4665, is listed with a spectral type of B7He wk C in RM09. In a detailed study of the object, Levato & Malaroda (1977) confirm the peculiar nature of HD 161733A and conclude that the star is a B-type peculiar object whose main peculiarities are being He weak; showing an enhancement of C and, perhaps, Fe and Ti; and the presence of Mn, P, Hg, and, possibly, Sr. They also find some evidence of variation in the C II  $\lambda 4267$  and Si II  $\lambda \lambda 4128-30$  lines. We have not found a reference to a photometric variability study in the literature.

From an analysis of ASAS-3 data, we derive a photometric period of  $P = 0.97235(1)$  d (Fig. 4). While the period value is close to one day, the significance of the detection and the amplitude of variability (0.02 mag, as derived with PERIOD04) are high. HD 161733 is a visual double star, the B component being of 10th magnitude and separated from the A component by  $27''$ . Furthermore, the RM09 catalogue indicates that HD 161733A is likely a spectroscopic binary characterized by a variable radial velocity and a supposed period of  $\sim 1.8$  d, which is about twice our period value. Thus, further studies are required to decide whether the derived photometric

period is caused by rotational or orbital modulation.

#### 4.2.7. HD 186205

HD 186205 was identified as being a pronounced member of the class of He-rich stars by Walborn (1975). Lee & O'Brien (1977) confirmed Walborn's results and derived  $T_{\text{eff}} = 23,500^\circ \text{K}$ ,  $M/M_\odot = 12.3$ ,  $R/R_\odot = 6.0$  and  $\log(L/L_\odot) = 4.0$  – typical values for a He-rich star. On the basis of their data, they did not reach conclusive results about the presence of spectral variability in this star, which is listed with a spectral type of B3He in the RM09 catalogue. To the best of our knowledge, HD 186205 has never been confirmed as a photometrically variable star.

An analysis of ASAS-3 data indicates light variability with a period of  $P = 37.28(2)$  d. The resulting phase plot looks convincing (Fig. 4), and the amplitude of variability is relatively high ( $\sim 0.01$  mag, as derived with PERIOD04).

The time-scale of the observed variability places the star outside the period domain of typical short-period, early-type pulsators like e.g. the  $\beta$  Cephei variables. On the other hand, the observed variability is reminiscent of the PV Telescopii stars (GCVS-type PVTEL), subclass 'PVTELI'. However, this class is reserved for hydrogen-deficient A or late-B supergiants, whereas HD 186205 is a confirmed dwarf star and does not show a pronounced hydrogen deficiency (Bouigue et al. 1961; Walborn 1975).

Rotationally induced variability due to surface inhomogeneities might thus be the most promising explanation of the observed light changes, although orbital variability due to an as yet undetected companion star cannot be ruled out. Long-term spectroscopic monitoring of HD 186205 is needed to reach a final conclusion concerning the nature of the observed variability.

## 5. CONCLUSION

We have compiled an extensive target list of magnetic chemically peculiar (CP2/4) stars from the General Catalogue of Ap, HgMn, and Am stars (RM09). In addition to that, a systematic investigation of early-type (spectral types B/A) variable stars of undetermined type in

the VSX yielded additional ACV candidates, which were included in our sample.

We investigated our sample stars using publicly available observations from the ASAS-3 archive. Employing a refined methodological approach, 360 stars exhibiting photometric variability in the accuracy limit of the ASAS-3 data were found. We thereby expand on a previous sample of 323 variable stars (Paper 1) and conclude our search for new photometrically variable magnetic chemically peculiar stars in the ASAS-3 archive.

From an analysis of all available data, we conclude that our final sample is composed of 334 bona-fide ACV variables, 23 ACV candidates and three eclipsing binary systems. We present summary data, folded light curves and, if available, information from the literature for all our sample stars and discuss interesting and unusual objects in detail. In particular, we call attention to HD 66051 (V414 Pup), which was identified as an eclipsing binary system showing obvious rotational modulation of the light curve due to the presence of an ACV variable in the system.

No further statistical analyses are presented in the present paper but will be given in a future publication that will include results from the literature as well as our own investigations (Paper 1, Bernhard et al. 2015b, this paper).

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*Facilities:* ASAS, AAVSO

*Software:* Period04

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## APPENDIX



**Table 2.** Essential data for the stars identified as photometrically variable chemically peculiar stars or star candidates in the present paper.

Star	ID (RM09)	$\alpha$ (J2000)	$\delta$ (J2000)	Type	Range (V) [mag]	Period [d]	Epoch (HJD) [d]	$A_1$ [mag]	$A_2$ [mag]	$\phi_1$ [rad]	$\phi_2$ [rad]	Spectral type	(B - V) [mag]	(J - K <sub>s</sub> ) [mag]
HD 2957	760	00 32 44.08	-13 29 13.5	ACV	8.48-8.51	4.6327(3)	4627.91(9)	0.011	0.002	0.846	0.750	B9 Cr Eu	+0.052	-0.017
HD 3885	1050	00 41 18.31	-19 51 45.9	ACV	9.79-9.81	1.81508(4)	2910.72(4)	0.007	0.009	0.348	0.449	B9 Si	-0.090	-0.079
HD 5823	1540	00 59 39.29	-11 56 01.2	ACV	9.95-9.97	1.24520(2)	3765.53(2)	0.007	0.004	0.723	0.646	F2 Sr Eu Cr	+0.304	+0.176
HD 8783	2110	01 24 00.43	-72 19 27.9	ACV	7.80-7.82	19.396(5)	3794.5(4)	0.009	0.001	0.102	0.715	A2 Sr Eu Cr	+0.150	+0.039
HD 12559		02 03 29.36	+18 19 39.4	ACV:	8.41-8.44	4.0358(3)	3338.62(8)	0.010	0.012	0.479	0.293	A2	+0.092	-0.034
HD 16145	4060	02 35 04.20	-17 17 22.3	ACV	7.64-7.67	2.23766(7)	4525.52(4)	0.011	0.002	0.342	0.873	A0 Cr Sr Eu	+0.117	-0.023
HD 20505	5120	03 15 03.18	-59 11 36.1	ACV	9.88-9.90	2.04401(5)	2666.49(4)	0.009	0.002	0.222	0.726	A2 Cr Sr	+0.120	+0.001
HD 22032	5540	03 33 11.64	+04 40 13.3	ACV	9.05-9.07	4.8589(3)	3031.57(9)	0.010	0.001	0.839	0.523	A3 Sr Eu Cr	+0.455	+0.056
HD 23509	6020	03 41 29.82	-66 28 37.9	ACV:	7.75-7.78	1.48786(3)	3010.64(3)	0.012	0.002	0.302	0.426	A3	+0.309	+0.167
HD 27210	6960	04 15 22.02	-51 44 27.1	ACV:	10.09-10.12	1.01438(1)	3447.55(2)	0.015	0.000	0.120	—	A0	+0.064	-0.046
HD 28238	7210	04 27 35.96	+06 36 43.2	ACV	9.11-9.12	24.743(7)	2676.5(5)	0.007	0.001	0.615	0.177	A0 Sr Cr Eu	+0.241	+0.053
HD 30374	7830	04 39 01.57	-75 06 10.1	ACV	10.02-10.04	1.55631(3)	3018.65(3)	0.008	0.003	0.097	0.580	A0 Sr Eu Cr	+0.105	+0.081
HD 240563	8310	05 04 57.34	+08 50 05.6	ACV	10.09-10.12	2.9447(1)	4399.78(6)	0.015	0.003	0.646	0.601	A3 Sr	+0.216	+0.078
HD 245155	9662	05 35 42.79	+25 16 29.4	ACV	9.67-9.69	0.705370(7)	3730.62(1)	0.009	0.001	0.809	0.251	B9 Si Sr	+0.080	+0.109
HD 38417	10330	05 38 55.39	-71 38 20.1	ACV	9.61-9.63	2.16619(6)	3086.56(4)	0.002	0.008	0.096	0.011	A0 Sr	+0.121	+0.044
HD 38912	10450	05 49 13.10	+01 27 30.2	ACV	9.46-9.49	1.46279(2)	2539.74(3)	0.013	0.003	0.608	0.148	B8 Si	+0.266	+0.106
HD 39082	10500	05 50 23.85	+04 57 24.3	ACV	7.41-7.42	0.764776(7)	4877.58(2)	0.007	0.001	0.045	0.341	B9 Sr Cr Eu	+0.039	-0.041
HD 40071	10680	05 56 06.12	-13 08 07.2	ACV	8.06-8.08	1.98735(5)	4477.82(4)	0.005	0.005	0.744	0.369	B9 Si	-0.042	-0.062
HD 40383	10780	05 58 37.50	+04 29 33.6	ACV	8.98-9.00	4.0364(3)	3644.86(8)	0.009	0.007	0.739	0.771	B9 Si	+0.215	+0.059
HD 40678	10876	06 01 29.21	+23 42 14.2	ACV	7.37-7.39	22.029(6)	2678.2(4)	0.012	0.001	0.238	0.541	A0 Si Sr	+0.158	-0.085
CD-32 2739	11090	06 03 47.11	-32 11 34.3	ACV	10.05-10.07	6.9928(5)	2910.8(1)	0.008	0.001	0.455	0.561	Sr Cr Eu	+0.457	+0.045
BD-06 1402		06 05 39.47	-06 03 15.0	ACV:	9.71-9.80	1.13063(2)	4776.79(2)	0.035	0.020	0.873	0.896	A0	+0.040	-0.016
HD 41869	11177	06 08 39.66	+25 39 26.2	ACV	9.03-9.07	5.2350(4)	3655.8(1)	0.015	0.007	0.739	0.076	B9 Si	+0.031	-0.036
HD 42574	11350	06 11 25.85	-02 00 25.9	ACV	8.90-8.93	0.847825(9)	2558.84(2)	0.015	0.002	0.615	0.666	A0 Si	+0.050	-0.045
BD-21 1382	11430	06 11 28.19	-21 49 30.6	ACV	10.06-10.10	2.29493(7)	3819.58(5)	0.011	0.011	0.427	0.049	Sr	-0.062	-0.040
HD 256476	11870	06 23 48.27	+10 33 12.5	ACV	10.58-10.62	51.23(3)	3106(1)	0.010	0.010	0.086	0.524	A2 Si	+0.135	-0.032
HD 45029	11950	06 24 50.94	-07 36 07.2	ACV	8.53-8.55	1.90908(4)	3480.54(4)	0.008	0.007	0.631	0.457	B8 Si	-0.080	-0.069
HD 45698	12150	06 27 11.33	-37 06 07.4	ACV	8.16-8.18	1.08456(1)	4350.88(2)	0.007	0.000	0.088	—	A2 Sr Eu	+0.189	+0.091
HD 257776	12060	06 27 56.29	+07 58 05.1	ACV	10.18-10.22	4.9217(3)	2886.78(9)	0.009	0.013	0.192	0.708	A0 Si	+0.087	-0.033
HD 45582	12118	06 28 07.40	-03 07 58.9	ACV	8.78-8.80	0.678061(6)	3068.58(1)	0.006	0.002	0.244	0.249	A0 Si	-0.026	+0.029
HD 258428	12230	06 29 54.94	+06 09 18.7	ACV	9.24-9.26	6.8776(5)	2922.0(1)	0.007	0.002	0.989	0.945	A7 Sr Cr Eu	+0.201	+0.034
HD 46105	12340	06 31 40.52	+05 46 08.9	ACV	6.96-6.97	0.793263(8)	3768.72(2)	0.006	0.002	0.781	0.998	A1 Si	-0.032	-0.041
HD 46649	12497	06 33 54.32	-16 36 57.0	ACV	9.56-9.57	4.1792(3)	3500.80(8)	0.006	0.001	0.077	0.481	A0 Eu Cr Sr	+0.126	+0.098
HD 48160	12920	06 41 39.82	-08 31 26.8	ACV	10.21-10.23	2.70521(9)	4827.71(5)	0.008	0.003	0.024	0.683	A0 Si	+0.069	-0.040
HD 48478	12960	06 43 09.24	-11 46 43.6	ACV	10.25-10.27	0.571729(4)	2912.88(1)	0.006	0.002	0.880	0.053	B9 Si	+0.030	+0.037
CPD-20 1640	13287	06 46 43.29	-20 54 47.1	EA	11.04-11.17	2.43400(2)	3460.62(1)	—	—	—	—	A5 Si Sr	+0.649	+0.105
HD 49299	13300	06 46 56.61	-20 39 07.1	ACV	10.19-10.21	16.172(4)	2762.5(3)	0.009	0.002	0.843	0.276	A0 Si Sr Cr	+0.030	-0.060
HD 49797	13490	06 48 24.80	-39 12 09.6	ACV	9.84-9.85	1.22649(2)	2201.79(2)	0.006	0.001	0.559	0.800	B9 Si	-0.111	-0.039
BD-14 1598	13470	06 48 57.53	-14 40 35.1	ACV	10.12-10.15	1.31890(2)	2892.91(3)	0.010	0.004	0.273	0.945	Sr	+0.094	+0.040
HD 50031	13600	06 50 41.64	-14 13 18.0	ACV	9.66-9.68	2.8743(1)	2757.49(6)	0.004	0.004	0.575	0.008	F0 Sr Eu Cr	+0.273	+0.042
HD 50285	13764	06 52 06.56	-11 39 10.7	ACV	9.81-9.82	0.643637(5)	2676.57(1)	0.006	0.002	0.148	0.941	A0 Si	-0.021	+0.002
HD 266311	13980	06 54 58.17	+04 08 27.5	ACV	9.76-9.78	0.94661(1)	4521.66(2)	0.006	0.002	0.041	0.525	A2 Sr Cr Eu	+0.128	+0.000
HD 51342	14144	06 56 02.44	-24 10 02.1	ACV:	10.51-10.55	1.43601(2)	3520.50(3)	0.014	0.003	0.197	0.489	A0	+0.184	-0.006
HD 52264	14340	07 00 24.06	-03 00 40.3	ACV	8.68-8.70	7.8234(7)	3731.7(2)	0.010	0.001	0.728	0.806	B9 Si	-0.033	-0.039
HD 52599	14410	07 00 46.11	-27 07 46.9	ACV	8.50-8.52	9.3435(9)	2251.5(2)	0.004	0.002	0.838	0.797	A5 Sr Cr Eu	+0.252	+0.119
HD 53062	14580	07 03 03.11	-15 43 11.3	ACV	9.47-9.48	1.41944(2)	3747.80(3)	0.005	0.002	0.440	0.065	A0 Si	-0.033	+0.062
HD 54399	14920	07 04 38.75	-61 50 38.2	ACV	9.79-9.81	2.50142(8)	3749.73(5)	0.007	0.001	0.701	0.815	A2 Sr Cr Eu	+0.281	+0.153
CD-32 3643	14800	07 05 23.50	-33 05 36.8	ACV	10.14-10.15	0.596399(5)	2797.45(1)	0.008	0.001	0.298	0.491	Si	+0.038	+0.066
HD 296343	14760	07 05 59.30	-05 06 17.3	ACV	10.37-10.39	9.8306(9)	5144.7(2)	0.013	0.001	0.442	0.114	A5 Sr Cr Eu	+0.529	+0.036
HD 53998	14840	07 07 30.50	+09 02 37.6	ACV	9.79-9.82	0.743062(7)	4561.51(1)	0.012	0.001	0.950	0.601	B9 Si	+0.021	+0.013
HD 56286	15310	07 14 03.59	-48 06 27.5	ACV	9.53-9.55	3.3971(2)	4849.50(7)	0.012	0.004	0.130	0.945	A0 Si	-0.012	-0.003
HD 56366	15370	07 16 11.18	-13 43 39.1	ACV	9.01-9.03	5.0871(4)	2544.9(1)	0.006	0.003	0.592	0.175	B9 Si	-0.064	-0.079
HD 56907	15530	07 16 19.76	-50 02 54.4	ACV	7.44-7.46	8.8234(8)	4091.3(2)	0.008	0.003	0.106	0.353	A0 Si	-0.042	-0.043
HD 57141	15607	07 19 14.16	-18 19 32.8	ACV	9.88-9.90	1.89739(4)	4582.58(4)	0.008	0.002	0.535	0.418	A0 Si	+0.036	+0.047
BD-07 1884	15580	07 19 24.23	-07 31 50.9	ACV	10.13-10.15	75.97(4)	1873(2)	0.011	0.002	0.095	0.416	Sr Cr Eu	+0.047	+0.026
CD-24 5203	15670	07 19 48.41	-24 31 12.4	ACV	9.94-9.98	13.215(3)	3758.4(3)	0.016	0.003	0.393	0.900	Si	+0.014	-0.069
HD 57368	15676	07 20 21.95	-13 22 15.8	ACV	10.08-10.09	3.5286(2)	3445.56(7)	0.006	0.003	0.136	0.005	B9 Si	+0.066	+0.054
HD 57683	15740	07 21 55.04	-10 24 10.1	ACV	9.76-9.78	2.27096(7)	4363.88(5)	0.009	0.004	0.201	0.530	B9 Si	+0.059	-0.055
HD 57964A	15790	07 21 56.14	-37 29 33.5	ACV	9.40-9.42	0.676093(6)	2252.76(1)	0.011	0.001	0.727	0.704	B9 Si	+0.117	+0.044
HD 58868	16070	07 25 54.38	-35 35 35.0	ACV	9.58-9.61	2.63764(9)	4919.51(5)	0.010	0.001	0.638	0.564	A3 Sr Cr Eu	+0.195	-0.013
HD 59021	16130	07 27 42.92	-11 47 45.7	ACV	9.70-9.72	2.29219(7)	3791.70(5)	0.007	0.003	0.683	0.332	A0 Eu Cr	+0.007	-0.023
CD-31 4653	16400	07 31 35.82	-31 30 28.6	ACV	10.43-10.46	4.4925(3)	3877.53(9)	0.011	0.005	0.638	0.529	Si	-0.070	-0.089
BD-16 2004	16430	07 32 32.83	-16 40 00.6	ACV	10.42-10.44	4.9805(4)	4600.52(9)	0.009	0.004	0.896	0.484	Si	+0.059	+0.018
HD 60572	16560	07 33 44.53	-34 35 23.8	ACV	9.37-9.40	1.94864(5)	2140.92(4)	0.010	0.002	0.024	0.606	A0 Sr Eu Cr	+0.099	+0.061
HD 61008		07 35 37.22	-36 09 46.7	ACV:	7.84-7.87	2.66482(9)	3030.59(5)	0.010	0.009	0.516	0.250	B8 II	-0.134	-0.121
CD-30 4807	16730	07 36 47.56	-30 30 45.6	ACV	10.80-10.82	13.868(3)	4517.9(3)	0.006	0.005	0.993	0.152	Si	-0.118	-0.062
HD 62005	17020	07 41 05.41	-22 42 10.5	ACV	10.21-10.24	1.48699(3)	4531.60(3)	0.010	0.011	0.374	0.733	A1 Si	-0.028	-0.030
HD 62080	17035	07 41 36.77	-17 26 12.8	ACV	10.15-10.19	4.4325(3)	4818.85(9)	0.016	0.007	0.604	0.419	A0 Si	+0.113	-0.035
HD 62752A	17280	07 43 46.16	-39 52 28.9	ACV	8.11-8.12	2.31727(7)	2944.80(5)	0.006	0.002	0.812	0.276	B9 Si	-0.024	-0.104

Table 2. continued.

Star	ID (RM09)	$\alpha$ (J2000)	$\delta$ (J2000)	Type	Range (V)	Period	Epoch (HJD)	$A_1$	$A_2$	$\phi_1$	$\phi_2$	Spectral type	(B - V)	(J - K <sub>s</sub> )
					[mag]	[d]	[d]	[mag]	[mag]	[rad]	[rad]		[mag]	[mag]
HD 62821A	17300	07 44 54.96	-25 00 26.2	ACV	9.56-9.62	3.8347(2)	4509.77(8)	0.029	0.003	0.697	0.906	B9 Si	-0.081	-0.083
HD 62905	17310	07 45 39.83	-16 58 36.6	ACV	9.66-9.68	16.836(4)	4508.1(3)	0.009	0.003	0.952	0.292	A2 Eu Cr	+0.057	-0.028
HD 64698	17730	07 53 25.00	-40 15 59.6	ACV	9.53-9.54	3.0226(1)	3090.66(6)	0.006	0.001	0.244	0.735	A0 Cr	+0.092	-0.004
GSC 08911-01572	17995	07 56 32.84	-60 53 08.9	ACV:	11.43-11.51	5.5805(4)	4825.7(1)	0.037	0.003	0.041	0.122			+0.099
HD 65208	17870	07 56 37.53	-28 12 28.4	ACV	9.21-9.23	1.14192(2)	3502.55(2)	0.009	0.000	0.497	-	B8 Si	-0.097	-0.107
HD 66051	18190	08 01 24.64	-12 47 35.8	EA+ACV	8.80-9.12	4.74922(1)	2167.867(5)	0.015	0.004	0.516	0.695	A0 Si	-0.047	-0.061
CPD-64 810	18520	08 02 42.43	-64 46 18.2	ACV	10.15-10.17	3.7736(2)	4215.72(8)	0.006	0.003	0.660	0.395	Si	+0.048	+0.039
HD 67313	18570	08 05 15.06	-46 44 33.6	ACV	9.08-9.09	0.825618(9)	2213.91(2)	0.004	0.002	0.254	0.291	A0 Cr Si Eu	+0.031	-0.059
HD 67398	18630	08 05 31.97	-49 22 48.9	ACV	9.38-9.40	2.01085(5)	3385.67(4)	0.006	0.001	0.055	0.353	A0 Si Cr Eu	+0.014	+0.051
HD 67909	18720	08 07 39.90	-53 29 24.1	ACV	8.95-8.97	2.41433(8)	4755.83(5)	0.008	0.001	0.924	0.609	B9 Cr Eu	+0.281	+0.113
HD 68250	18847	08 08 02.00	-61 33 11.8	ACV:	9.36-9.37	0.841212(9)	4797.80(2)	0.007	0.003	0.213	0.917	A4	+0.189	+0.072
HD 68013	18800	08 08 02.37	-52 48 06.6	ACV	9.18-9.19	1.27689(2)	3699.78(3)	0.004	0.001	0.290	0.785	B9 Eu Cr Si	+0.021	+0.008
HD 67975	18760	08 09 30.59	-26 20 20.3	ACV	10.04-10.07	2.7547(1)	3367.64(6)	0.008	0.009	0.170	0.820	A0 Sr	+0.175	+0.019
HD 68326A	18890	08 09 34.03	-50 13 26.8	ACV	9.03-9.05	5.1484(4)	2196.7(1)	0.007	0.002	0.170	0.396	A0 Si	+0.031	-0.022
HD 68322	18880	08 10 01.07	-44 20 45.1	ACV	8.55-8.57	1.76642(3)	4202.65(4)	0.005	0.004	0.386	0.481	B8 Si	-0.141	-0.108
HD 68555	19000	08 10 52.59	-46 54 53.7	ACV	9.26-9.28	1.81896(4)	4227.57(4)	0.008	0.006	0.553	0.448	B8 Si	-0.007	-0.060
HD 68807A	19080	08 12 03.12	-46 12 33.2	ACV	9.18-9.20	1.72010(3)	3802.62(3)	0.005	0.003	0.150	0.286	A0 Eu Cr Sr	+0.059	-0.169
BD-21 2324	19070	08 12 56.83	-22 03 05.6	ACV	10.54-10.60	1.75612(3)	2192.75(4)	0.016	0.016	0.966	0.558	Si	+0.050	-0.084
HD 68781	19075	08 13 16.98	-18 46 46.6	ACV	10.27-10.29	3.2112(1)	2754.58(6)	0.008	0.002	0.050	0.156	A Sr Eu Cr	+0.113	+0.024
HD 69146	19160	08 13 21.61	-50 35 07.3	ACV	10.59-10.12	1.04934(1)	2676.62(2)	0.010	0.005	0.914	0.306	A2 Si	+0.057	+0.095
HD 69067A	19150	08 13 46.60	-37 43 27.4	ACV	8.20-8.22	3.6677(2)	4551.61(7)	0.008	0.002	0.748	0.802	B8 Si	-0.123	-0.134
HD 69204	19174	08 14 59.19	-23 36 36.8	ACV	10.00-10.02	1.65858(3)	3851.55(3)	0.008	0.002	0.639	0.253	A5 Sr	+0.200	+0.035
HD 69862	19290	08 15 29.32	-61 51 09.4	ACV	10.07-10.08	0.518885(3)	4865.64(1)	0.007	0.001	0.656	0.538	A2 Sr Eu Cr	+0.262	+0.097
HD 69728	19270	08 16 29.27	-42 15 37.3	ACV	9.30-9.31	1.63779(3)	4884.72(3)	0.005	0.001	0.238	0.672	B9 Si Cr	+0.008	+0.030
HD 70123	19370	08 18 18.85	-45 48 15.1	ACV	10.08-10.10	1.89507(4)	4700.92(4)	0.009	0.004	0.246	0.460	A0 Si	-0.014	+0.001
HD 70464	19440	08 20 08.12	-47 39 36.8	ACV	8.30-8.32	1.09268(2)	1984.52(2)	0.009	0.004	0.537	0.348	B9 Si	-0.122	-0.125
BD-19 2372	19460	08 21 32.92	-19 52 48.1	ACV	10.20-10.27	3.2950(1)	1905.75(7)	0.029	0.009	0.383	0.991	Si	+0.052	-0.050
HD 70847	19570	08 22 45.33	-38 53 38.7	ACV	8.98-8.99	1.03445(1)	2520.91(2)	0.006	0.002	0.835	0.471	B8 Si	-0.040	-0.075
HD 71034A	19633	08 24 46.26	-14 04 16.5	ACV	9.72-9.74	5.3998(4)	4531.7(1)	0.009	0.002	0.523	0.255	A0 Si	+0.043	-0.068
HD 72034	19880	08 28 48.02	-45 44 06.9	ACV	9.50-9.52	1.66998(3)	4258.51(3)	0.009	0.003	0.764	0.688	B9 Si	-0.010	+0.055
HD 72634	20130	08 29 42.93	-67 08 23.3	ACV	7.28-7.29	0.93062(1)	2963.81(2)	0.005	0.000	0.028	-	A0 Eu Cr Sr	+0.030	+0.009
HD 72401	20040	08 30 59.13	-42 10 39.4	ACV	9.53-9.55	2.49212(8)	1939.63(5)	0.007	0.005	0.245	0.265	B8 Si	-0.014	+0.027
HD 72976	20250	08 33 05.54	-56 23 47.8	ACV	7.49-7.52	3.8560(2)	4127.66(8)	0.013	0.007	0.170	0.932	B9 Si	-0.100	-0.115
HD 72770	20160	08 33 44.02	-28 08 04.3	ACV	9.02-9.05	4.7915(3)	3413.74(9)	0.007	0.010	0.426	0.841	A0 Cr Eu	+0.026	-0.018
CD-37 4863	20210	08 34 02.07	-37 43 57.2	ACV	9.40-9.42	2.31312(7)	2628.80(5)	0.007	0.003	0.449	0.707	Cr Eu	+0.059	+0.031
HD 73101	20300	08 35 50.67	-21 59 32.6	ACV	9.42-9.43	0.93463(1)	2698.54(2)	0.004	0.001	0.478	0.189	B9 Sr Eu	+0.005	+0.004
HD 74631	20860	08 44 12.95	-24 57 56.0	ACV	9.46-9.47	1.94874(5)	2241.76(4)	0.006	0.002	0.352	0.102	A0 Si	-0.049	-0.020
CD-38 4858	21010	08 46 44.43	-38 38 33.0	ACV	9.82-9.84	9.6457(9)	3407.9(2)	0.012	0.004	0.519	0.065	Sr Eu	0.467	+0.070
HD 76164	21330	08 50 53.55	-65 03 25.9	ACV	8.54-8.56	5.5097(4)	3391.8(1)	0.010	0.001	0.142	0.614	B8 Si	-0.045	-0.020
HD 76141	21320	08 52 11.03	-53 39 23.6	ACV	10.03-10.05	2.53809(9)	4862.78(5)	0.009	0.003	0.930	0.861	A0 Si	+0.073	+0.011
HD 76424	21500	08 54 14.69	-46 29 46.9	ACV	9.40-9.42	2.48068(8)	2228.77(5)	0.006	0.001	0.272	0.260	A0 Si	-0.080	-0.054
HD 76877	21680	08 56 43.34	-52 57 40.1	ACV	9.89-9.90	13.491(3)	5138.9(3)	0.007	0.002	0.904	0.812	A0 Cr Sr Eu	+0.280	+0.045
HD 76759A	21644	08 57 49.06	-13 05 37.5	ACV	9.17-9.19	1.20648(2)	4125.64(2)	0.007	0.002	0.316	0.518	A0 Eu Sr Cr	+0.158	+0.076
HD 77044	21720	08 58 59.37	-29 30 08.8	ACV	9.50-9.53	2.9112(1)	2249.77(6)	0.008	0.006	0.788	0.212	B9 Si	+0.054	+0.030
HD 77716	21990	09 03 06.31	-36 10 43.7	ACV	10.04-10.07	3.5012(2)	4641.48(7)	0.007	0.005	0.994	0.439	A0 Si	-0.010	-0.035
HD 77809	22030	09 03 23.72	-39 17 13.6	ACV	10.32-10.34	2.37366(7)	2249.75(5)	0.008	0.001	0.965	0.069	A0 Sr	+0.278	+0.121
HD 311542	22520	09 08 37.27	-73 44 03.3	ACV	9.83-9.85	2.58490(9)	3674.81(5)	0.009	0.003	0.227	0.369	A0 Cr Eu	+0.045	-0.055
HD 78930	22370	09 08 48.70	-53 14 51.3	ACV	9.47-9.48	2.52196(8)	4629.60(5)	0.006	0.001	0.983	0.397	B9 Eu Cr	-0.019	-0.037
HD 78611	22280	09 09 03.96	-05 57 40.8	ACV	8.68-8.70	18.805(5)	4091.9(4)	0.010	0.002	0.219	0.496	A3 Sr Eu	+0.066	-0.002
HD 79986	22760	09 11 47.25	-74 36 50.6	ACV	8.83-8.84	5.1547(4)	1994.6(1)	0.005	0.003	0.681	0.922	A0 Si	-0.033	-0.006
HD 79795	22700	09 13 14.75	-61 55 12.1	ACV	9.66-9.67	5.4500(4)	3386.7(1)	0.006	0.001	0.291	0.111	B9 Si	+0.044	+0.040
HD 299978	22910	09 18 18.89	-55 24 49.9	ACV	9.30-9.32	6.7022(5)	2232.8(1)	0.010	0.002	0.646	0.344	B9 Si	+0.086	+0.021
HD 84451	24090	09 37 54.83	-80 21 01.7	ACV	8.06-8.08	2.74154(9)	4643.49(5)	0.009	0.003	0.069	0.199	B9 Si	+0.042	-0.031
HD 84653	24150	09 45 06.55	-52 21 42.9	ACV	9.40-9.41	3.2575(1)	2926.87(7)	0.006	0.001	0.218	0.174	A0 Si	-0.050	-0.084
HD 84945	24250	09 46 50.53	-55 25 21.2	ACV	9.38-9.40	9.3950(9)	4500.8(2)	0.008	0.005	0.849	0.550	A0 Si	+0.059	+0.064
HD 85984	24540	09 53 30.07	-59 17 25.9	ACV	10.30-10.32	1.78867(3)	4656.47(4)	0.008	0.002	0.377	0.289	A0 Si	-0.033	+0.059
HD 86405	24720	09 53 50.72	-75 22 49.3	ACV	8.09-8.10	4.0322(3)	2649.61(8)	0.005	0.001	0.623	0.521	B9 Si	+0.033	+0.012
HD 86290	24710	09 55 25.63	-59 56 18.7	ACV	9.77-9.78	1.01266(1)	4089.79(2)	0.006	0.001	0.017	0.671	A0 Si	-0.045	-0.065
HD 86824	24810	09 59 11.43	-58 14 44.9	ACV	9.51-9.52	2.46692(8)	4136.81(5)	0.006	0.003	0.811	0.947	A Si	-0.038	-0.072
HD 87087	24900	10 01 03.43	-57 05 49.6	ACV	9.98-10.00	3.1392(1)	4193.73(6)	0.007	0.000	0.823	-	A3 Sr Eu Cr	+0.203	+0.090
CPD-59 1669	24936	10 01 32.64	-59 56 11.7	ACV:	11.58-11.62	3.8271(2)	2676.56(8)	0.022	0.004	0.370	0.046		-0.151	-0.019
HD 88814	25420	10 12 52.35	-58 36 49.0	ACV	10.13-10.15	1.59222(3)	2680.75(3)	0.008	0.002	0.135	0.375	B9 Si	+0.015	-0.044
HD 90233	25940	10 23 33.56	-56 02 09.4	ACV	9.70-9.72	1.63271(3)	4606.65(3)	0.011	0.001	0.311	0.650	A0 Si	+0.000	+0.006
HD 91134	26210	10 30 54.26	-26 05 44.7	ACV	8.40-8.43	3.9013(2)	4149.75(8)	0.008	0.007	0.138	0.354	B9 Si	-0.070	-0.142
CD-39 6470	26310	10 32 40.36	-40 09 06.2	ACV	10.13-10.14	1.94271(5)	2067.48(4)	0.006	0.001	0.601	0.291	Sr Eu	+0.219	+0.124
HD 91520	26330	10 33 23.73	-38 54 52.5	ACV	9.97-10.00	1.36459(2)	2249.83(3)	0.009	0.006	0.003	0.330	A0 Sr Cr Eu	+0.031	+0.082
HD 91825A	26400	10 34 43.81	-59 54 13.9	ACV	9.58-9.60	2.7634(1)	4277.57(6)	0.009	0.003	0.955	0.694	B8 Si	-0.016	+0.041
HD 91982	26440	10 36 15.65	-50 08 50.3	ACV	9.50-9.51	2.21863(6)	2225.82(4)	0.007	0.001	0.531	0.300	A4 Sr Cr Eu	+0.201	+0.091
HD 92315	26570	10 37 20.53	-69 21 45.2	ACV	8.29-8.31	1.57651(3)	3905.64(3)	0.004	0.001	0.341	0.044	A1 Cr Sr Eu	+0.125	+0.028

Table 2. continued.

Star	ID (RM09)	$\alpha$ (J2000)	$\delta$ (J2000)	Type	Range (V)	Period	Epoch (HJD)	$A_1$	$A_2$	$\phi_1$	$\phi_2$	Spectral type	(B - V)	(J - K <sub>s</sub> )
					[mag]	[d]	[d]	[mag]	[mag]	[rad]	[rad]		[mag]	[mag]
HD 92384	26618	10 38 37.14	-59 07 31.1	ACV:	8.60-8.61	2.29382(7)	4656.55(5)	0.007	0.003	0.885	0.674	B9	-0.031	-0.012
HD 303209	26727	10 40 12.16	-59 24 41.9	ACV:	10.37-10.40	1.60624(3)	4391.90(3)	0.011	0.005	0.362	0.292	A0	+0.061	+0.013
HD 93500A	27010	10 46 24.96	-59 26 42.8	ACV	8.81-8.82	2.36348(7)	2660.82(5)	0.005	0.000	0.952	-	B9 Cr Eu Sr	+0.068	-0.056
HD 94052	27190	10 50 19.82	-55 12 30.0	ACV	9.70-9.71	7.6468(7)	5024.3(2)	0.005	0.003	0.726	0.690	B9 Cr Eu Sr	+0.147	+0.047
HD 94681	27320	10 54 37.17	-58 54 25.7	ACV	9.46-9.48	3.5444(2)	2790.52(7)	0.006	0.002	0.512	0.112	B9 Si	-0.008	-0.033
HD 95491	27510	11 00 35.51	-51 38 38.0	ACV	9.22-9.23	4.8538(3)	2990.83(9)	0.004	0.001	0.634	0.204	A5 Sr Cr Eu	+0.257	+0.136
HD 96204	27700	11 05 00.20	-47 58 19.1	ACV:	9.15-9.18	3.5745(2)	2783.48(7)	0.012	0.001	0.056	0.383	A3	+0.213	+0.112
HD 96471	27810	11 06 11.09	-56 28 33.9	ACV	9.22-9.23	4.9296(3)	3528.63(9)	0.004	0.003	0.016	0.143	B8 Si	+0.047	+0.019
HD 98340	28350	11 17 53.70	-59 14 11.0	ACV	7.18-7.19	3.1467(1)	2829.50(6)	0.005	0.001	0.582	0.366	B9 Si	-0.035	-0.057
HD 99147	28550	11 23 52.10	-59 29 31.8	ACV	9.36-9.38	1.33305(2)	4455.79(3)	0.009	0.004	0.311	0.356	A0 Si	+0.028	+0.078
HD 99824	28710	11 28 25.93	-60 36 33.7	ACV	8.98-9.00	7.2198(6)	3407.7(1)	0.007	0.003	0.797	0.740	A0 Si	-0.070	-0.023
HD 99826	28720	11 28 26.05	-61 35 04.0	ACV	9.64-9.65	0.810497(8)	4203.69(2)	0.006	0.001	0.217	0.573	B9 Si	+0.028	+0.061
HD 101037	29090	11 36 54.47	-69 42 40.7	ACV	9.70-9.72	0.97650(1)	1926.82(2)	0.009	0.002	0.554	0.373	B9 Si	+0.221	+0.195
HD 101891	29360	11 42 51.87	-73 30 29.3	ACV	10.58-10.60	0.89496(1)	4192.67(2)	0.010	0.003	0.898	0.433	A2 Si	+0.295	+0.020
HD 102454	29530	11 47 26.21	-31 15 17.2	ACV	7.31-7.33	2.07906(5)	2014.60(4)	0.007	0.003	0.609	0.922	B9 Si	-0.045	-0.018
HD 102820	29680	11 49 52.29	-67 30 40.6	ACV	9.56-9.58	1.74806(3)	2675.78(3)	0.010	0.002	0.100	0.172	B9 Si	+0.132	+0.071
HD 103210	29770	11 52 59.76	-52 37 58.7	ACV	10.18-10.22	4.7161(3)	4135.82(9)	0.019	0.006	0.862	0.796	F0 Sr Cr Eu	+0.387	+0.074
HD 103457	29820	11 54 32.74	-63 42 02.1	ACV	7.80-7.82	2.23225(7)	3826.76(4)	0.013	0.001	0.431	0.373	A0 Si	-0.014	-0.015
HD 103671	29910	11 56 08.02	-56 26 37.0	ACV	8.76-8.78	2.36547(7)	3820.73(5)	0.008	0.001	0.522	0.691	B8 Si	-0.075	-0.042
HD 104899A	30370	12 04 43.01	-57 11 56.5	ACV	9.00-9.01	1.18111(2)	1919.86(2)	0.005	0.000	0.254	-	A0 Si	-0.056	-0.061
HD 106204	30700	12 13 19.43	-65 37 12.4	ACV	8.62-8.64	4.3572(3)	2724.70(9)	0.010	0.002	0.448	0.107	B9 Si	+0.010	-0.092
BD+01 2668	30750	12 13 25.29	+01 09 21.7	ACV:	10.24-10.26	0.98410(1)	2623.81(2)	0.008	0.001	0.495	0.577	B8	-0.096	-0.091
HD 106244	30730	12 13 35.95	-60 35 43.1	ACV	9.50-9.52	1.14779(2)	2482.53(2)	0.005	0.005	0.784	0.049	B9 Si	+0.066	+0.028
HD 106982	30940	12 18 26.67	-59 37 31.5	ACV	8.71-8.72	2.18467(6)	2709.70(4)	0.007	0.003	0.296	0.258	B8 Si	-0.004	-0.028
CPD-69 1655	31110	12 21 02.38	-69 57 06.3	ACV	10.52-10.54	2.28185(7)	4180.69(5)	0.007	0.004	0.625	0.969	A5 Si	+0.125	+0.058
HD 108087	31370	12 25 24.77	-53 53 08.9	ACV	9.64-9.65	7.5201(7)	3453.8(2)	0.006	0.002	0.374	0.217	B9 Si	+0.064	+0.010
HD 109300	31700	12 34 06.13	-58 51 48.5	ACV	10.28-10.30	2.63189(9)	3183.58(5)	0.010	0.002	0.173	0.551	B9 Si	+0.110	+0.005
HD 109809	31860	12 38 15.79	-61 36 07.2	ACV	8.45-8.46	4.8184(3)	4468.81(9)	0.006	0.002	0.331	0.929	B9 Si	+0.082	+0.053
HD 109830	31870	12 38 18.08	-57 10 31.9	ACV	10.35-10.38	3.4537(2)	3047.74(7)	0.011	0.005	0.452	0.720	B9 Si	+0.047	+0.085
HD 110072	31970	12 39 50.21	-34 22 28.9	ACV	10.06-10.09	22.225(6)	3810.1(4)	0.010	0.000	0.322	-	Sr Cr	+0.394	+0.093
HD 110274	32040	12 41 30.96	-58 55 24.4	ACV	9.41-9.44	265.1(4)	2765(4)	0.015	0.005	0.330	0.852	A0 Eu Cr	+0.297	+0.094
CD-65 1322	32110	12 43 04.19	-66 21 52.3	ACV	9.46-9.49	3.2860(1)	3775.79(7)	0.012	0.006	0.874	0.542	Si Sr	+0.099	+0.108
HD 110568	32140	12 43 32.74	-54 52 22.2	ACV	9.82-9.84	9.6018(9)	2658.8(2)	0.006	0.002	0.940	0.782	A9 Cr Eu	+0.434	+0.231
HD 112252	32600	12 56 15.36	-61 45 17.9	ACV	8.42-8.43	9.6021(9)	3548.1(2)	0.007	0.002	0.219	0.748	B9 Si	+0.340	+0.132
HD 113434	32890	13 05 44.07	-74 53 29.5	ACV	9.44-9.46	0.860123(9)	4304.57(2)	0.005	0.006	0.205	0.536	B9 Si	+0.007	-0.020
HD 114697	33170	13 13 21.69	-60 38 50.4	ACV	9.78-9.83	2.34421(7)	4164.78(5)	0.024	0.001	0.131	0.801	B9 Si	+0.023	+0.017
HD 114721	33190	13 14 34.89	-73 39 08.4	ACV	9.16-9.18	2.33380(7)	4273.66(5)	0.010	0.005	0.392	0.472	B9 Si	+0.036	-0.005
HD 115398	33330	13 17 58.54	-56 11 57.6	ACV	10.18-10.22	0.720460(7)	3837.73(1)	0.014	0.011	0.925	0.211	B8 Si	+0.022	-0.054
HD 115226	33300	13 18 00.02	-72 57 01.0	ACV	8.53-8.55	2.9882(1)	4612.58(6)	0.006	0.004	0.143	0.524	A3 Sr	+0.330	+0.091
HD 115440	33340	13 20 04.50	-76 25 09.1	ACV	8.26-8.27	5.4421(4)	5088.6(1)	0.007	0.003	0.816	0.599	B9 Si	+0.066	+0.019
HD 116124	33540	13 23 32.96	-69 10 42.7	ACV	9.27-9.31	2.25634(7)	3115.66(5)	0.015	0.007	0.924	0.067	B9 Si	+0.080	+0.053
HD 116557	33620	13 25 11.74	-49 49 46.8	ACV	10.39-10.41	0.92626(1)	2027.56(2)	0.010	0.001	0.787	0.345	B9 Si	-0.024	-0.051
HD 117055	33770	13 28 37.95	-48 24 31.1	ACV	9.15-9.18	1.82613(4)	3604.50(4)	0.014	0.003	0.945	0.081	B8 Si	-0.059	-0.042
HD 117096	33800	13 29 41.02	-64 55 34.5	ACV	10.37-10.39	2.12428(6)	4464.83(4)	0.008	0.003	0.996	0.119	B9 Si	+0.043	+0.047
HD 117692	33970	13 33 40.45	-64 00 10.4	ACV	9.54-9.55	3.2798(1)	3074.73(7)	0.006	0.002	0.372	0.783	B9 Si	+0.030	-0.011
HD 118167	34070	13 36 16.62	-54 41 51.2	ACV	9.85-9.87	0.91102(1)	3858.61(2)	0.009	0.001	0.310	0.809	A0 Si	+0.029	+0.068
HD 118470	34210	13 38 20.33	-54 38 21.1	ACV	10.03-10.06	3.9728(2)	3793.86(8)	0.013	0.005	0.833	0.854	A2 Sr Eu Cr	+0.198	+0.088
HD 118737	34290	13 40 39.68	-64 54 07.4	ACV	9.81-9.82	1.77752(3)	2853.52(4)	0.007	0.001	0.372	0.197	B9 Si	+0.019	+0.043
HD 119238	34420	13 43 23.30	-55 44 58.1	ACV	10.04-10.06	1.74149(3)	2676.56(3)	0.007	0.003	0.717	0.015	B9 Si	+0.000	+0.025
HD 119474	34500	13 45 11.60	-61 13 00.6	ACV	9.99-10.03	1.89143(4)	3171.71(4)	0.009	0.013	0.888	0.974	A0 Si	+0.019	-0.023
HD 120016	34590	13 47 38.55	-41 41 30.1	ACV	8.95-8.97	2.36784(7)	3125.67(5)	0.006	0.006	0.565	0.725	B9 Si	-0.082	-0.007
HD 121142	34870	13 55 10.11	-57 34 57.5	ACV	10.32-10.34	1.69062(3)	3497.73(3)	0.014	0.001	0.896	0.801	B9 Si	+0.047	+0.023
HD 121265	34900	13 55 35.47	-47 59 00.7	ACV	9.48-9.50	0.782664(8)	3421.84(2)	0.009	0.001	0.742	0.605	B9 Si	-0.056	-0.032
HD 121675	34990	13 57 57.51	-48 11 08.9	ACV	9.72-9.73	3.0786(1)	4533.60(6)	0.008	0.002	0.093	0.935	A5 Cr Eu Sr	+0.234	+0.108
HD 121661	34970	13 58 42.42	-62 43 07.1	ACV	8.57-8.60	46.86(2)	4253.6(9)	0.015	0.001	0.004	0.041	A0 Eu Cr Si	+0.104	-0.008
HD 121841	35030	13 59 57.86	-62 59 42.4	ACV	10.02-10.04	1.08529(2)	3753.87(2)	0.012	0.002	0.889	0.075	B8 Si	+0.090	+0.030
HD 122463	35120	14 03 14.77	-48 29 30.1	ACV	9.87-9.92	1.84717(4)	3829.72(4)	0.010	0.022	0.645	0.154	A0 Si	-0.007	+0.002
HD 122525	35140	14 03 59.12	-53 43 10.2	ACV	8.76-8.77	26.072(8)	4642.0(5)	0.007	0.001	0.693	0.466	A0 Eu Sr Cr	+0.271	+0.069
HD 122983	35240	14 06 13.70	-48 23 12.7	ACV:	9.78-9.81	3.6166(2)	2026.62(7)	0.011	0.003	0.399	0.031	A0	+0.132	+0.049
HD 123164	35300	14 07 13.83	-46 24 16.5	ACV	9.89-9.90	2.51961(8)	5042.51(5)	0.006	0.002	0.479	0.151	A2 Sr Eu Cr	+0.345	+0.068
HD 123350	35360	14 10 07.65	-69 38 44.9	ACV	10.17-10.20	5.9931(4)	5088.5(1)	0.017	0.001	0.683	0.670	A0 Si	+0.141	+0.118
HD 123884	35436	14 10 33.78	-17 59 27.3	ACV:	9.31-9.32	1.02101(1)	4570.84(2)	0.006	0.003	0.947	0.151	B8 He wk.	+0.054	+0.072
HD 124455	35640	14 15 53.25	-61 11 26.9	ACV	9.57-9.58	0.606079(5)	4338.53(1)	0.005	0.001	0.479	0.757	B7 Si	+0.174	+0.048
HD 124598	35670	14 15 56.99	-49 42 35.0	ACV	9.68-9.71	2.19784(6)	2058.52(4)	0.015	0.004	0.067	0.659	B8 Si	-0.052	-0.023
HD 124269	35570	14 16 16.82	-72 36 47.8	ACV	9.61-9.63	3.5433(2)	2830.57(7)	0.009	0.002	0.934	0.981	B8 Si	+0.031	+0.006
HD 124437	35620	14 16 20.98	-66 11 36.2	ACV	8.96-9.97	5.9563(4)	4612.4(1)	0.003	0.003	0.369	0.020	A0 Cr Sr Eu	+0.156	+0.057
HD 125532	35850	14 21 33.23	-52 51 58.0	ACV	9.21-9.23	1.81159(4)	1961.83(4)	0.012	0.002	0.810	0.937	B8 Si	+0.085	+0.008
HD 126322	36010	14 28 24.60	-70 34 08.5	ACV	9.42-9.47	2.8673(1)	2878.56(6)	0.021	0.004	0.876	0.559	A0 Si	-0.014	+0.028
HD 126786	36110	14 29 06.60	-47 23 19.3	ACV	9.92-9.95	0.853773								

Table 2. continued.

Star	ID (RM09)	$\alpha$ (J2000)	$\delta$ (J2000)	Type	Range (V)	Period	Epoch (HJD)	$A_1$	$A_2$	$\phi_1$	$\phi_2$	Spectral type	(B - V)	(J - K <sub>s</sub> )
					[mag]	[d]	[d]	[mag]	[mag]	[rad]	[rad]		[mag]	[mag]
HD 126876	36120	14 30 03.93	-56 55 02.4	ACV	8.36-8.39	11.426(1)	3804.8(2)	0.013	0.003	0.842	0.523	B8 Si	+0.175	+0.049
HD 127021	36150	14 30 55.83	-54 32 24.4	ACV	9.80-9.81	2.01366(5)	4514.87(4)	0.007	0.004	0.698	0.492	B9 Sr Cr	+0.274	+0.138
HD 127224	36200	14 32 56.61	-65 08 18.2	ACV	9.83-9.86	6.5031(5)	4669.5(1)	0.012	0.003	0.693	0.733	B8 Si	+0.234	+0.055
HD 127924	36350	14 36 01.53	-56 27 36.5	ACV:	9.22-9.24	3.5487(2)	2868.59(7)	0.008	0.001	0.460	0.831	B8	+0.099	+0.090
HD 127957	36360	14 36 33.23	-59 17 28.4	ACV	9.00-9.01	3.2801(1)	3798.82(7)	0.008	0.001	0.579	0.852	B9 Si	-0.002	+0.014
HD 128226	36440	14 38 05.24	-59 09 47.3	ACV	10.02-10.04	2.48567(8)	4715.58(5)	0.010	0.004	0.806	0.418	B9 Si	+0.063	+0.023
HD 128676	36610	14 41 08.31	-64 13 10.2	ACV	9.12-9.13	2.40052(7)	5063.52(5)	0.007	0.002	0.409	0.006	B9 Si	+0.036	+0.024
HD 128574	36570	14 41 34.29	-70 22 43.3	ACV	9.57-9.59	2.13656(6)	2476.49(4)	0.010	0.003	0.522	0.721	A Si	+0.035	+0.046
HD 128997A	36740	14 43 23.03	-66 46 43.0	ACV	8.85-8.86	6.7382(5)	2456.5(1)	0.007	0.004	0.143	0.643	B9 Si	+0.090	+0.000
HD 129460	36910	14 44 32.92	-54 31 22.5	ACV	9.98-10.02	1.76444(3)	4974.84(4)	0.020	0.006	0.163	0.876	B9 Si	-0.021	+0.058
HD 129934	37050	14 47 39.39	-58 51 45.1	ACV	10.50-10.54	2.17566(6)	4703.62(4)	0.011	0.015	0.694	0.945	B9 Si	+0.073	+0.095
HD 129994	37070	14 47 47.58	-55 38 30.1	ACV	10.12-10.14	1.51008(3)	4698.72(3)	0.009	0.001	0.185	0.863	A0 Sr	+0.116	+0.075
HD 130382	37130	14 50 21.36	-60 14 34.9	ACV	10.34-10.36	1.66901(3)	3444.80(3)	0.009	0.002	0.793	0.751	B9 Eu Cr Sr	+0.213	+0.068
HD 130660	37180	14 51 25.81	-53 54 49.6	ACV	9.31-9.33	0.718005(7)	2755.67(1)	0.005	0.005	0.643	0.917	B8 Si	+0.029	-0.032
HD 129899	37030	14 51 30.04	-77 10 33.5	ACV	6.46-6.47	1.03504(1)	4622.77(2)	0.004	0.001	0.502	0.099	A0 Si	-0.020	-0.032
HD 131171	37290	14 55 16.73	-65 17 06.4	ACV	8.92-8.93	23.452(7)	2722.0(5)	0.007	0.002	0.636	0.005	B9 Si	+0.057	-0.009
HD 131505A	37350	14 58 16.52	-70 55 49.6	ACV	8.63-8.65	1.25794(2)	1985.78(3)	0.012	0.003	0.258	0.395	B9 Si	-0.030	-0.160
HD 132634	37620	15 05 25.85	-73 53 17.6	ACV	9.25-9.29	1.72199(3)	3896.73(3)	0.016	0.009	0.676	0.029	A0 Si	-0.062	+0.010
HD 133281	37840	15 06 41.29	-62 40 31.4	ACV	8.99-9.01	0.583908(4)	4597.68(1)	0.010	0.001	0.797	0.421	B9 Si	-0.021	-0.045
HD 133757	37960	15 08 30.90	-55 58 49.1	ACV	8.19-8.20	2.43257(8)	3435.92(5)	0.005	0.002	0.475	0.221	B8 Si	-0.005	-0.012
HD 133428	37860	15 11 08.66	-76 56 59.3	ACV	9.08-9.11	1.51763(3)	5037.54(3)	0.004	0.016	0.169	0.073	A0 Si	+0.178	+0.056
HD 134465	38170	15 12 19.83	-54 54 13.3	ACV	9.97-9.99	9.2207(9)	3492.7(2)	0.008	0.000	0.964	-	A0 Eu Cr Sr	+0.165	-0.017
HD 134507	38190	15 12 40.92	-56 47 18.1	ACV	9.64-9.65	1.48757(3)	2052.63(3)	0.006	0.001	0.922	0.881	A2 Sr	+0.363	+0.179
HD 134109	38070	15 15 27.03	-77 41 51.8	ACV	9.19-9.21	3.7579(2)	4701.63(8)	0.006	0.001	0.675	0.228	B9 Si	-0.023	-0.039
HD 135815	38620	15 18 37.35	-41 07 22.5	ACV	9.31-9.32	14.843(3)	3606.5(3)	0.006	0.004	0.618	0.863	A2 Cr Eu Sr	+0.248	+0.053
HD 135916	38650	15 20 19.31	-56 46 07.5	ACV	9.79-9.81	1.69429(3)	4707.58(3)	0.009	0.005	0.276	0.753	B8 Si	+0.026	-0.048
HD 135480	38480	15 22 45.23	-77 42 19.2	ACV	8.91-8.93	3.4759(2)	4152.92(7)	0.010	0.001	0.006	0.003	F0 Sr Cr Eu	+0.187	+0.030
HD 136357	38750	15 22 53.36	-57 03 01.9	ACV	10.00-10.01	1.92479(5)	2676.60(4)	0.005	0.001	0.073	0.886	B9 Si	+0.576	+0.254
HD 136467	38790	15 22 59.91	-51 55 12.3	ACV	10.06-10.08	3.8222(2)	4654.57(8)	0.009	0.003	0.983	0.228	A0 Si	+0.106	+0.074
HD 136024	38700	15 23 03.30	-70 33 36.0	ACV	9.66-9.67	3.2654(1)	4204.43(7)	0.005	0.001	0.266	0.485	B9 Si	+0.007	-0.042
HD 137065	38920	15 26 50.13	-59 57 02.1	ACV	8.25-8.27	6.0242(5)	2821.5(1)	0.010	0.001	0.434	0.760	B9 Si	-0.010	-0.034
HD 137309	39000	15 26 55.08	-44 36 22.5	ACV	8.59-8.60	2.19247(6)	3530.86(4)	0.005	0.004	0.326	0.850	B9 Si	+0.014	-0.010
HD 137363	39040	15 27 47.84	-51 35 58.6	ACV	9.48-9.50	19.785(6)	3530.8(4)	0.011	0.004	0.283	0.907	B9 Si	+0.021	-0.026
HD 137848	39190	15 29 49.34	-41 04 19.5	ACV	9.39-9.40	3.5224(2)	3847.75(7)	0.006	0.003	0.418	0.053	A2 Cr Sr Eu	+0.061	+0.066
HD 136575	38810	15 29 58.30	-78 50 29.0	ACV	10.21-10.23	4.5579(3)	2565.53(9)	0.007	0.004	0.707	0.558	A2 Sr	+0.280	+0.042
HD 138079	39290	15 32 27.01	-56 52 38.8	ACV	10.73-10.76	1.67525(3)	4962.66(3)	0.008	0.007	0.255	0.167	B9 Si	+0.177	+0.021
HD 138167	39340	15 33 03.53	-57 47 21.0	ACV	8.84-8.85	4.7076(3)	4298.55(9)	0.004	0.002	0.759	0.442	B8 Si	+0.099	+0.024
HD 138209	39350	15 33 50.43	-61 48 19.0	ACV	9.78-9.81	1.50568(3)	2083.59(3)	0.006	0.012	0.815	0.140	A0 Si	+0.076	+0.026
HD 138586	39450	15 34 56.79	-48 39 06.5	ACV	8.66-8.70	2.08837(6)	3530.87(4)	0.014	0.014	0.004	0.288	B9 Si	-0.009	+0.024
HD 139149	39620	15 39 52.81	-61 47 53.8	ACV	9.91-9.92	1.64538(3)	5093.45(3)	0.006	0.002	0.126	0.502	B9 Si	+0.097	+0.105
HD 139631	39730	15 40 45.12	-40 04 58.6	ACV	8.74-8.76	2.14271(6)	3517.72(4)	0.006	0.006	0.009	0.342	A0 Eu Cr Sr	+0.208	+0.039
HD 139855	39770	15 46 31.11	-73 24 23.2	ACV	10.94-10.96	7.2384(6)	3808.8(1)	0.008	0.002	0.571	0.954	A0 Si	+0.035	-0.042
HD 140532	39930	15 47 01.83	-58 06 52.5	ACV	10.36-10.38	1.07077(1)	4644.63(2)	0.011	0.001	0.070	0.679	B7 Si	+0.394	-0.020
HD 141317	40120	15 50 34.60	-49 21 10.2	ACV	8.95-8.98	5.3558(4)	4126.9(1)	0.008	0.005	0.037	0.730	A0 Cr Eu Si	+0.111	+0.042
HD 141586	40200	15 53 38.49	-64 00 30.2	ACV	9.79-9.80	3.4344(2)	2794.58(7)	0.006	0.001	0.006	0.524	A0 Si	+0.056	-0.012
HD 141981	40290	15 53 39.46	-42 50 32.2	ACV	9.88-9.91	9.0467(9)	3906.7(2)	0.012	0.002	0.961	0.871	B9 Eu Cr Sr	+0.257	+0.144
HD 142554	40450	15 55 22.34	-04 28 34.6	ACV	9.79-9.81	4.2647(3)	1931.86(9)	0.014	0.002	0.825	0.656	A0 Si Cr Eu	+0.205	+0.036
HD 142823	40500	15 58 52.13	-49 06 43.2	ACV	9.00-9.01	1.29857(2)	2069.61(3)	0.006	0.001	0.034	0.207	B9 Cr Si	+0.113	+0.054
HD 142960	40520	16 01 00.84	-61 00 07.2	ACV	9.64-9.65	7.5954(7)	2787.8(2)	0.006	0.000	0.766	-	A0 Sr Cr Eu	+0.214	+0.101
HD 144102	40820	16 06 40.61	-53 11 09.7	ACV	9.32-9.34	4.6801(3)	4204.81(9)	0.008	0.004	0.296	0.915	B9 Si	+0.055	+0.066
HD 144748	41020	16 08 20.80	-25 07 37.8	ACV	8.61-8.63	4.9549(3)	3037.88(9)	0.011	0.002	0.566	0.671	F0 Sr Eu Cr	+0.184	+0.106
HD 144264A	40870	16 08 27.69	-61 30 11.6	ACV	8.73-8.74	1.25143(2)	5098.51(3)	0.007	0.000	0.637	-	B9 Si	-0.078	-0.023
HD 144991	41080	16 11 01.80	-51 17 47.3	ACV	9.77-9.81	7.2533(6)	2512.5(1)	0.021	0.001	0.361	0.358	B8 Si	+0.327	+0.110
HD 145364	41150	16 16 04.93	-70 32 33.6	ACV	9.32-9.34	3.3088(1)	2719.89(7)	0.007	0.002	0.664	0.841	B9 Si	+0.006	+0.009
HD 146246	41350	16 18 06.78	-55 31 10.3	ACV	9.86-9.87	1.64744(3)	3619.51(3)	0.007	0.001	0.738	0.371	B9 Si	+0.139	+0.067
HD 146447	41390	16 19 26.88	-56 54 40.5	ACV	10.35-10.37	2.11213(6)	4759.57(4)	0.008	0.003	0.238	0.942	B9 Si	-0.005	+0.004
HD 147259	41600	16 23 10.64	-50 17 04.4	ACV	9.88-9.91	1.92935(5)	2750.81(4)	0.011	0.004	0.898	0.316	A0 Si	-0.047	-0.051
HD 147345	41610	16 23 32.46	-46 43 51.2	ACV	9.12-9.13	23.342(6)	2040.7(5)	0.006	0.001	0.347	0.481	A3 Sr Cr Eu	+0.248	+0.056
HD 328193	41890	16 28 46.04	-43 43 49.5	ACV	9.66-9.71	1.80614(4)	2853.53(4)	0.028	0.002	0.877	0.676	B8 Si	+0.177	+0.028
CD-64 1049	41820	16 29 57.10	-64 54 49.6	ACV	10.23-10.24	0.542445(4)	4651.67(1)	0.007	0.000	0.405	-	Cr Eu	+0.240	-0.017
CD-28 12149	42000	16 30 07.56	-28 33 47.3	ACV	10.74-10.76	1.35884(2)	3882.76(3)	0.010	0.001	0.377	0.948	Si	+0.154	+0.114
HD 148935	42080	16 33 20.26	-41 45 34.8	ACV	9.41-9.43	0.862919(9)	3074.90(2)	0.007	0.003	0.358	0.067	B9 Si	+0.227	+0.101
HD 149228	42200	16 34 24.19	-25 32 59.1	ACV	10.01-10.02	1.54043(3)	3558.72(3)	0.006	0.002	0.528	0.412	B9 Si	+0.311	+0.206
HD 149334	42270	16 35 23.60	-34 00 49.7	EA	9.11-9.32	3.54420(6)	4258.86(2)	-	-	-	-	A7 Sr	+0.455	+0.221
HD 149115	42150	16 35 31.88	-54 49 25.3	ACV	9.68-9.70	5.9392(4)	3866.7(1)	0.009	0.003	0.732	0.231	B9 Si	+0.040	+0.034
HD 149236	42210	16 37 26.93	-62 56 27.4	ACV	10.19-10.21	3.8586(2)	3653.46(8)	0.008	0.001	0.937	0.669	B9 Si	+0.085	-0.001
HD 149409	42280	16 38 06.91	-60 28 25.7	ACV	9.39-9.43	3.2749(1)	2885.61(7)	0.019	0.003	0.662	0.418	A0 Si Cr	+0.187	-0.067
HD 149769	42380	16 40 47.25	-62 25 54.1	ACV	9.75-9.77	8.2422(8)	4130.0(2)	0.007	0.003	0.684	0.654	A5 Sr Eu Cr	+0.324	+0.030
HD 150323	42500	16 41 43.41	-32 49 16.5	ACV	7.61-7.64	5.3777(4)	3526.8(1)	0.012	0.005	0.007	0.013	B6 Si	+0.096	+0.014



Table 2. continued.

Star	ID (RM09)	$\alpha$ (J2000)	$\delta$ (J2000)	Type	Range (V)	Period	Epoch (HJD)	$A_1$	$A_2$	$\phi_1$	$\phi_2$	Spectral type	(B - V)	(J - K <sub>s</sub> )
					[mag]	[d]	[d]	[mag]	[mag]	[rad]	[rad]		[mag]	[mag]
HD 150137	42460	16 41 54.33	-54 07 36.8	ACV	8.82-8.86	5.1512(4)	4181.9(1)	0.016	0.001	0.899	0.200	B9 Si	+0.110	+0.016
CD-59 6262	42470	16 43 16.14	-59 59 50.2	ACV	9.88-9.91	0.844887(9)	2503.58(2)	0.015	0.003	0.632	0.193	Si	-0.019	-0.022
CD-60 6444	42720	16 49 00.54	-60 28 00.8	ACV	9.60-9.62	4.4673(3)	3583.73(9)	0.010	0.007	0.381	0.375	B9 Si	+0.011	-0.059
HD 152099	43040	16 53 43.44	-47 24 48.4	ACV	10.18-10.20	3.2074(1)	4276.45(6)	0.011	0.002	0.379	0.332	A0 Si	+0.230	+0.067
HD 152137	43070	16 54 49.91	-57 25 04.1	ACV	9.66-9.68	1.33044(2)	4756.51(3)	0.006	0.002	0.561	0.543	A2 Sr Cr Eu	+0.161	+0.108
HD 152834	43260	16 56 58.02	-26 57 05.6	ACV	8.84-8.87	4.2928(3)	3602.32(9)	0.013	0.000	0.606	—	A0 Si	+0.017	-0.006
HD 153997A	43520	17 03 36.26	-19 27 43.8	ACV	9.46-9.50	5.5002(4)	4571.9(1)	0.012	0.009	0.544	0.321	A0 Si	+0.078	+0.007
HD 154772	43710	17 09 44.94	-47 16 59.4	ACV	9.83-9.88	7.5426(7)	4758.5(2)	0.026	0.004	0.873	0.991	B8 Si	+0.169	+0.060
HD 155127	43810	17 10 52.14	-26 27 06.1	ACV	8.42-8.44	5.5243(4)	4233.8(1)	0.010	0.005	0.386	0.921	B9 Eu Cr Sr	+0.219	+0.085
HD 155188	43830	17 13 10.37	-55 36 52.3	ACV	9.91-9.92	3.3334(2)	2524.55(7)	0.004	0.001	0.371	0.142	F0 Sr Eu Cr	+0.120	+0.053
HD 155171	43820	17 13 21.57	-58 24 50.6	ACV	10.36-10.38	11.464(1)	2730.1(2)	0.007	0.002	0.617	0.541	A0 Cr Eu	+0.142	+0.121
HD 155366	43910	17 13 42.09	-49 53 26.1	ACV	9.28-9.29	1.85937(4)	3790.85(4)	0.005	0.002	0.937	0.308	A3 Sr Cr Eu	+0.285	+0.102
HD 156495	44070	17 21 03.99	-56 05 49.3	ACV	8.96-8.98	1.37863(2)	3524.76(3)	0.006	0.004	0.125	0.352	A0 Cr Eu Sr	+0.175	+0.067
HD 156853	44120	17 22 23.79	-49 45 42.2	ACV	7.63-7.65	1.15945(2)	4358.55(2)	0.009	0.003	0.613	0.418	B8 Si	-0.030	-0.028
HD 156869	44130	17 22 52.22	-52 58 41.4	ACV	7.95-7.97	2.8853(1)	2502.50(6)	0.007	0.003	0.355	0.121	A0 Sr Cr Eu	+0.120	+0.013
HD 158450	44620	17 29 43.99	-08 01 03.1	ACV	8.58-8.59	8.5239(8)	1997.9(2)	0.005	0.002	0.245	0.094	A0 Sr Cr Eu	+0.378	+0.183
HD 158202	44490	17 30 09.08	-46 11 58.7	ACV	9.78-9.80	6.2544(5)	2737.6(1)	0.014	0.002	0.129	0.224	A0 Si Cr Eu	-0.011	+0.016
HD 158343	44570	17 31 50.41	-55 26 47.8	ACV	9.66-9.67	0.669399(6)	2203.51(1)	0.007	0.001	0.021	0.282	B9 Si	+0.036	-0.012
HD 158293	44540	17 31 58.77	-58 35 51.6	ACV	8.93-8.95	10.445(1)	1986.2(2)	0.008	0.005	0.552	0.455	A0 Cr Eu Sr	+0.207	+0.033
HD 159379	44860	17 35 54.59	-33 50 56.5	ACV	8.56-8.58	8.2391(8)	4269.8(2)	0.010	0.002	0.538	0.956	B9 Si	+0.080	+0.041
HD 159317	44800	17 37 32.77	-58 28 16.0	ACV	9.98-10.00	2.72128(9)	2473.72(5)	0.008	0.002	0.789	0.615	A0 Si	-0.085	-0.129
HD 160445	45150	17 41 38.80	-37 21 27.7	ACV	9.66-9.68	1.43471(2)	4551.83(3)	0.011	0.002	0.082	0.451	A0 Si	+0.118	+0.100
HD 159992	45070	17 41 47.94	-62 20 50.5	ACV	9.42-9.43	1.55814(3)	2452.68(3)	0.005	0.001	0.762	0.485	B9 Eu Sr Cr	+0.059	+0.008
HD 161733A	45650	17 47 02.17	+05 41 30.6	ACV:	7.88-7.90	0.97235(1)	4269.76(2)	0.010	0.001	0.555	0.544	B7 He wk. C	+0.039	-0.065
HD 162651	45950	17 52 00.72	+01 05 57.3	ACV	7.23-7.24	0.760389(7)	1962.90(2)	0.007	0.000	0.322	—	A0 Si	+0.263	+0.087
HD 162316	45800	17 59 07.94	-75 47 55.6	ACV	9.36-9.38	9.3043(9)	4658.8(2)	0.011	0.001	0.009	0.577	A3 Sr Eu	+0.451	+0.045
HD 164085	46393	18 00 12.01	-17 05 20.5	ACV	10.24-10.27	1.22072(2)	3167.69(2)	0.011	0.008	0.847	0.902	A0 Si	+0.257	+0.147
HD 163833	46330	18 00 19.07	-42 36 59.3	ACV	9.60-9.62	12.379(2)	2125.6(2)	0.011	0.001	0.087	0.289	A0 Si	+0.034	+0.014
HD 163926	46360	18 00 30.59	-40 20 12.8	ACV	10.02-10.03	1.47161(2)	3603.66(3)	0.007	0.002	0.123	0.927	B8 Si	-0.123	-0.019
HD 164069	46390	18 00 31.24	-27 43 21.2	ACV	9.27-9.31	1.50183(3)	3191.73(3)	0.017	0.006	0.909	0.578	B9 Si	+0.029	-0.010
HD 164319	46460	18 01 58.98	-33 49 11.4	ACV	9.93-9.98	2.40879(8)	2494.62(5)	0.024	0.003	0.119	0.479	B8 Si	+0.026	-0.035
HD 164521	46500	18 03 19.55	-38 48 23.8	ACV	9.74-9.75	1.48232(2)	5021.82(3)	0.006	0.002	0.821	0.311	B9 Si	-0.092	-0.030
HD 166016	46750	18 08 35.46	+02 24 39.1	ACV	8.52-8.53	2.65405(9)	4905.90(5)	0.006	0.004	0.180	0.957	A2 Si	+0.120	+0.041
HD 165772	46700	18 09 02.65	-34 11 59.0	ACV	9.84-9.90	2.09098(6)	3581.51(4)	0.031	0.005	0.908	0.145	B9 Si	+0.031	-0.025
HD 165972	46740	18 09 32.60	-24 39 49.9	ACV	8.91-8.92	2.7596(1)	3541.80(6)	0.006	0.002	0.275	0.870	B9 Si	+0.052	+0.137
HD 166804	46927	18 13 03.39	-18 18 44.2	ACV	8.89-8.91	3.7035(2)	2482.55(7)	0.010	0.002	0.419	0.148	B9 Si	-0.026	-0.062
HD 166921	46960	18 13 38.97	-18 23 17.4	ACV	7.85-7.86	0.532859(3)	4286.72(1)	0.006	0.001	0.992	0.474	B8 Si	+0.030	+0.003
HD 166771	46920	18 13 51.31	-37 39 59.5	ACV	9.33-9.36	5.6884(4)	3472.7(1)	0.014	0.002	0.309	0.581	B9 Si	+0.045	-0.050
HD 167288	47030	18 15 30.28	-23 07 01.8	ACV	8.65-8.67	4.3475(3)	3177.59(9)	0.006	0.003	0.892	0.953	B7 Si Cr	+0.028	-0.022
HD 167211	47020	18 16 00.03	-40 46 17.1	ACV	10.02-10.04	0.815945(8)	4633.76(2)	0.011	0.001	0.761	0.767	B8 Si	+0.033	-0.091
HD 167476	47044	18 16 07.61	-17 38 11.6	ACV	10.44-10.47	3.2895(1)	4298.74(7)	0.010	0.008	0.906	0.144	B8 Si	-0.118	+0.074
HD 167592	47050	18 16 29.06	-14 14 44.1	ACV	8.65-8.67	1.70883(3)	5085.59(3)	0.010	0.001	0.700	0.529	B8 Si	+0.125	+0.022
HD 166953	46980	18 16 46.25	-59 33 47.3	ACV	7.71-7.73	2.58966(9)	1997.72(5)	0.010	0.003	0.288	0.950	A0 Si	-0.049	-0.050
HD 168057A	47100	18 19 13.32	-29 40 51.6	ACV	8.81-8.83	13.308(3)	3649.0(3)	0.008	0.003	0.607	0.293	A0 Si	+0.151	+0.060
HD 169380	47470	18 26 06.70	-37 54 42.9	ACV	9.84-9.95	4.0872(3)	3504.97(8)	0.008	0.001	0.183	0.746	A3 Eu Cr Sr	+0.094	+0.004
HD 170054	47660	18 27 14.69	+06 31 06.9	ACV	8.18-8.20	0.97317(1)	3672.50(2)	0.008	0.002	0.925	0.336	B7 Si	+0.030	-0.038
HD 169789	47520	18 27 45.35	-34 06 44.2	ACV	9.57-9.60	5.2315(4)	3634.5(1)	0.012	0.004	0.098	0.192	B8 Si	-0.043	-0.038
HD 170836	47830	18 32 12.30	-19 16 32.6	ACV:	8.96-8.99	19.516(5)	2843.9(4)	0.010	0.007	0.892	0.363	B7	+0.326	+0.142
HD 170860A	47840	18 32 27.01	-19 05 55.6	ACV:	9.42-9.43	1.38585(2)	4952.81(3)	0.009	0.001	0.903	0.473	B8	+0.168	+0.060
HD 170924	47870	18 33 15.88	-30 15 43.8	ACV	9.80-9.84	6.1265(5)	2792.6(1)	0.011	0.008	0.988	0.096	A0 Si	+0.108	+0.079
HD 171708	48106	18 37 05.85	-17 55 35.2	ACV	9.33-9.34	3.4878(2)	2544.49(7)	0.005	0.000	0.220	—	A0 Si	+0.142	+0.072
HD 172271	48270	18 39 03.57	+05 35 20.3	ACV	9.08-9.09	11.534(1)	3175.1(2)	0.007	0.003	0.502	0.148	A1 Sr Si	+0.050	+0.013
HD 172319	48280	18 40 58.01	-34 52 48.1	ACV	9.75-9.78	2.41211(8)	3455.77(5)	0.015	0.007	0.088	0.403	B9 Si	+0.016	-0.051
HD 172480	48320	18 41 24.69	-23 55 20.9	ACV	10.08-10.10	0.87134(1)	4729.55(2)	0.009	0.003	0.727	0.945	A0 Si	+0.175	+0.097
HD 173612	48630	18 46 30.94	-08 25 58.3	ACV	9.11-9.13	0.778179(7)	4546.86(2)	0.002	0.008	0.964	0.891	A0 Si	+0.257	+0.017
HD 173657	48690	18 47 37.15	-28 16 47.0	ACV	7.45-7.48	1.93789(5)	4969.77(4)	0.013	0.006	0.177	0.756	B9 Si Cr	+0.086	+0.055
HD 173361	48550	18 47 38.42	-52 28 02.2	ACV	9.07-9.08	0.831981(9)	2698.92(2)	0.008	0.002	0.794	0.856	B9 Si	-0.024	-0.057
HD 173562	48600	18 49 31.05	-58 56 52.0	ACV	7.91-7.92	2.30444(7)	4188.90(5)	0.003	0.003	0.886	0.333	A0 Cr Eu	+0.084	+0.011
HD 172164	48250	18 49 35.27	-78 40 45.3	ACV	9.62-9.67	1.60666(3)	4363.65(3)	0.011	0.017	0.849	0.795	A2 Si	+0.116	+0.012
HD 174146	48780	18 50 05.28	-24 14 02.4	ACV	10.11-10.16	11.185(1)	3618.0(2)	0.023	0.003	0.254	0.962	F Si	+0.431	+0.173
HD 174356	48843	18 51 08.61	-24 23 14.5	ACV	9.13-9.15	4.0431(3)	4765.67(8)	0.007	0.003	0.104	0.243	B9 Si	+0.210	+0.086
HD 174598	48870	18 52 37.65	-31 44 26.5	ACV	9.80-9.85	0.91682(1)	2788.82(2)	0.022	0.004	0.992	0.854	B9 Sr Eu Si	-0.071	-0.067
HD 175110	48996	18 54 14.64	-10 31 07.6	ACV	9.13-9.15	0.721487(7)	2734.86(1)	0.009	0.001	0.172	0.563	B9 Si	+0.150	+0.023
HD 176332	49200	19 00 25.14	-19 53 00.5	ACV	9.28-9.29	11.865(2)	4383.8(2)	0.007	0.002	0.217	0.936	B8 Si	-0.038	-0.016
HD 176656	49300	19 01 56.68	-15 46 43.9	ACV	10.28-10.30	1.04285(1)	2061.75(2)	0.007	0.004	0.828	0.603	A0 Si	+0.071	+0.003
HD 176519	49250	19 03 05.91	-49 18 21.9	ACV	9.66-9.67	2.08459(6)	2521.67(4)	0.006	0.002	0.020	0.490	A0 Cr Si Eu	+0.052	-0.084
HD 179711	49892	19 13 09.47	+12 01 21.6	ACV	8.34-8.38	2.9508(1)	2916.52(6)	0.018	0.005	0.440	0.931	A0 Si	+0.044	-0.098
HD 231041	50110	19 16 34.09	+14 37 12.4	ACV	8.79-8.80	10.772(1)	3639.5(2)	0.006	0.001	0.903	0.025	A0 Cr Eu Si	+0.049	+0.031
HD 338226	50350	19 21 59.89	+25 11 43.8	ACV	9.91-9.93									

Table 2. continued.

Star	ID (RM09)	$\alpha$ (J2000)	$\delta$ (J2000)	Type	Range (V)	Period	Epoch (HJD)	$A_1$	$A_2$	$\phi_1$	$\phi_2$	Spectral type	(B - V)	(J - K <sub>s</sub> )
					[mag]	[d]	[d]	[mag]	[mag]	[rad]	[rad]		[mag]	[mag]
HD 181549	50280	19 22 46.22	-41 18 29.8	ACV:	10.30-10.32	22.871(6)	3851.5(5)	0.006	0.003	0.330	0.974	A0	+0.066	+0.000
HD 231382	50540	19 25 43.69	+16 14 21.4	ACV	9.30-9.34	4.4773(3)	4684.69(9)	0.014	0.003	0.351	0.343	B9 Si	+0.291	+0.109
HD 183735	50740	19 30 50.66	+01 02 42.2	ACV	9.84-9.86	2.23029(6)	3164.72(4)	0.010	0.002	0.781	0.822	A2 Sr Cr Eu	+0.323	+0.071
HD 184539	50910	19 34 04.53	+24 35 16.4	ACV	8.75-8.78	2.57198(9)	4607.77(5)	0.013	0.003	0.249	0.669	A1 Si Sr	+0.061	-0.005
HD 186205	51340	19 42 37.85	+09 13 39.0	ACV:	8.57-8.58	37.28(2)	3527.7(7)	0.006	0.001	0.086	0.589	B3 He	+0.057	-0.072
HD 353530	51450	19 45 06.18	+14 08 09.5	ACV	9.98-10.00	2.08664(6)	2737.91(4)	0.009	0.002	0.648	0.544	A0 Si	+0.014	-0.054
HD 187715A	51780	19 51 02.80	+10 06 02.1	ACV	9.04-9.07	4.7498(3)	4349.59(9)	0.012	0.003	0.031	0.241	A0 Si	+0.047	-0.064
HD 189919	52670	20 01 51.23	+19 18 04.8	ACV	9.00-9.02	3.1006(1)	2805.81(6)	0.009	0.000	0.850	–	A Si	-0.052	-0.077
HD 351652	53400	20 10 12.12	+17 52 47.2	ACV	9.67-9.69	3.5613(2)	4643.69(7)	0.008	0.001	0.810	0.847	A2 Sr Eu	+0.219	+0.029
HD 193325	53960	20 19 00.95	+20 27 50.8	ACV	7.51-7.52	3.1529(1)	2843.87(6)	0.006	0.003	0.632	0.882	B9 Si	-0.152	-0.165
HD 340577	54670	20 34 40.83	+26 29 07.6	ACV	9.10-9.12	116.7(2)	3567(2)	0.011	0.001	0.171	0.683	A3 Sr Cr Eu	+0.205	-0.010
HD 198918		20 53 11.28	+15 25 54.8	ACV:	8.81-8.90	0.777809(7)	4376.58(2)	0.018	0.036	0.979	0.177	A0	+0.184	+0.055
HD 200199	55760	21 02 56.50	-29 06 37.2	ACV	7.01-7.02	1.03512(1)	3704.56(2)	0.004	0.002	0.782	0.118	A1 Cr	+0.113	+0.041
HD 205013		21 32 11.81	+10 54 39.0	ACV:	7.18-7.23	1.57624(3)	4602.91(3)	0.014	0.015	0.638	0.354	A0	-0.037	-0.035
HD 209605A	58310	22 05 14.24	-26 50 55.9	ACV	9.53-9.55	7.8132(7)	2025.5(2)	0.008	0.005	0.541	0.273	F0 Sr Eu	+0.322	+0.038

**Table 3.** Relevant information on single objects from the literature and miscellaneous remarks. An asterisk in column 7 ('Remarks/comments') denotes stars whose status as chemically peculiar objects is doubtful according to RM09. The following abbreviations are employed in column 7: R12 = [Rimoldini et al. \(2012\)](#); W12 = [Wraight et al. \(2012\)](#).

Star	Var. desig. Literature	Var. type Literature	Period (d) Literature	Period (d) This work	Reference	Remarks/comments Literature
HD 2957				4.6327(3)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 3885	NSV 15149	VAR		1.81508(4)	<a href="#">Wesselius et al. (1982)</a>	
HD 5823				1.24520(2)		Null result for roAp pulsations ( <a href="#">Kochukhov et al. 2013</a> ).
HD 8783	SMC V2339	VAR:	21(or 1.05)? (GCVS)	19.396(5)	GCVS	Non-member of the SMC according to the GCVS. The given period values are derived from variations of the peculiarity index $\Delta a$ .
HD 12559	HIP 9602	VAR	2.01833 (VSX); 2.01837 (R12)	4.0358(3)	<a href="#">Koen &amp; Eyer (2002)</a>	R12: SPB/ACV (prob: 0.24/0.51)
HD 16145			2.24(or 4.47)? (RM09)	2.23766(7)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 23509	HIP 17239	VAR	1.48779 (VSX); 1.48765 (R12)	1.48786(3)	<a href="#">Koen &amp; Eyer (2002)</a>	R12: SPB/DSCTC (prob: 0.23/0.33)
HD 27210				1.01438(1)		*
HD 240563				2.9447(1)		*
HD 245155				0.705370(7)		Constant or quality of data prevented detection (W12).
HD 38417				2.16619(6)		*
HD 39082	NSV 16689	VAR	0.76484 (VSX)	0.764776(7)	<a href="#">Vogt &amp; Faundez (1979)</a>	
HD 40678				22.029(6)		Constant or quality of data prevented detection (W12).
BD-06 1402	HIP 28864	VAR	1.13065 (VSX)	1.13063(2)	<a href="#">Koen &amp; Eyer (2002)</a>	R12: EB/SPB (prob: 0.15/0.57)
	ASAS J060540-0603.2	DCEP-FU/MISC	1.13058 (R12)			<a href="#">Richards et al. (2012)</a> : ACV (prob: 0.8109)
HD 41869				5.2350(4)		Constant or probably constant, blend? in STEREO data (W12).
HD 46105	NSV 16891	VAR		0.793263(8)	<a href="#">Rufener &amp; Bartholdi (1982)</a>	
HD 46649				4.1792(3)		RM09: A0 Si Cr ? *
HD 49797				1.22649(2)		*
HD 50031				2.8743(1)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 51342				1.43601(2)		*
HD 296343	GDS_J0705593-050617	VAR	n/a	9.8306(9)	<a href="#">Hackstein et al. (2015)</a>	
HD 57368				3.5286(2)		*
HD 57964A				0.676093(6)		The CP2 star may not be the A component (RM09). *
HD 61008	NSV 17517	VAR	1.33237 (VSX)	2.66482(9)	<a href="#">Koen &amp; Eyer (2002)</a>	
HD 62821A	GDS_J0744549-250026	VAR	n/a	3.8347(2)	<a href="#">Hackstein et al. (2015)</a>	
GSC 08911-01572				5.5805(4)		*
HD 66051	V414 Pup	EA+ACV	4.74922 ( <a href="#">Otero 2003</a> )	4.74922(1)	<a href="#">Otero (2003)</a>	Synchronous rotation. ACV and EA period are the same.
						Amp. of rot. var. = 0.05 mag ( <a href="#">Otero 2003</a> ).
HD 67909				2.41433(8)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 68250				0.841212(9)		*
HD 68322				1.76642(3)		*
HD 68781				3.2112(1)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 69728				1.63779(3)		*
HD 71034A				5.3998(4)		RM09: uncertain, which component is (weakly) Ap
HD 72634	HIP 41667	VAR	0.93051 (VSX)	0.93062(1)	<a href="#">Koen &amp; Eyer (2002)</a>	
HD 72976	HIP 41954	VAR	3.85654 (VSX); 3.85656 (R12)	3.8560(2)	<a href="#">Koen &amp; Eyer (2002)</a>	R12: SPB/ACV (prob: 0.31/0.40)
HD 72770	ASAS J083344-2808.1	ESD/EC	4.7930 (VSX)	4.7915(3)	<a href="#">Sitek &amp; Pojmański (2014)</a>	R12: BCEP/DSCT (prob: 0.30/0.49)
CD-38 4858	GDS_J0846444-383832	VAR	n/a	9.6457(9)	<a href="#">Hackstein et al. (2015)</a>	
HD 76759A				1.20648(2)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
HD 77809				2.37366(7)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).
CPD-59 1669				3.8271(2)		*
HD 91825A				2.7634(1)		*
HD 92315				1.57651(3)		*
HD 92384				2.29382(7)		*
HD 303209				1.60624(3)		*
HD 96204				3.5745(2)		*
HD 102454	ASAS J114726-3115.3	ED/ESD/SR	4.1579 ( <a href="#">Sitek &amp; Pojmański 2014</a> )	2.07906(5)	<a href="#">Sitek &amp; Pojmański (2014)</a>	

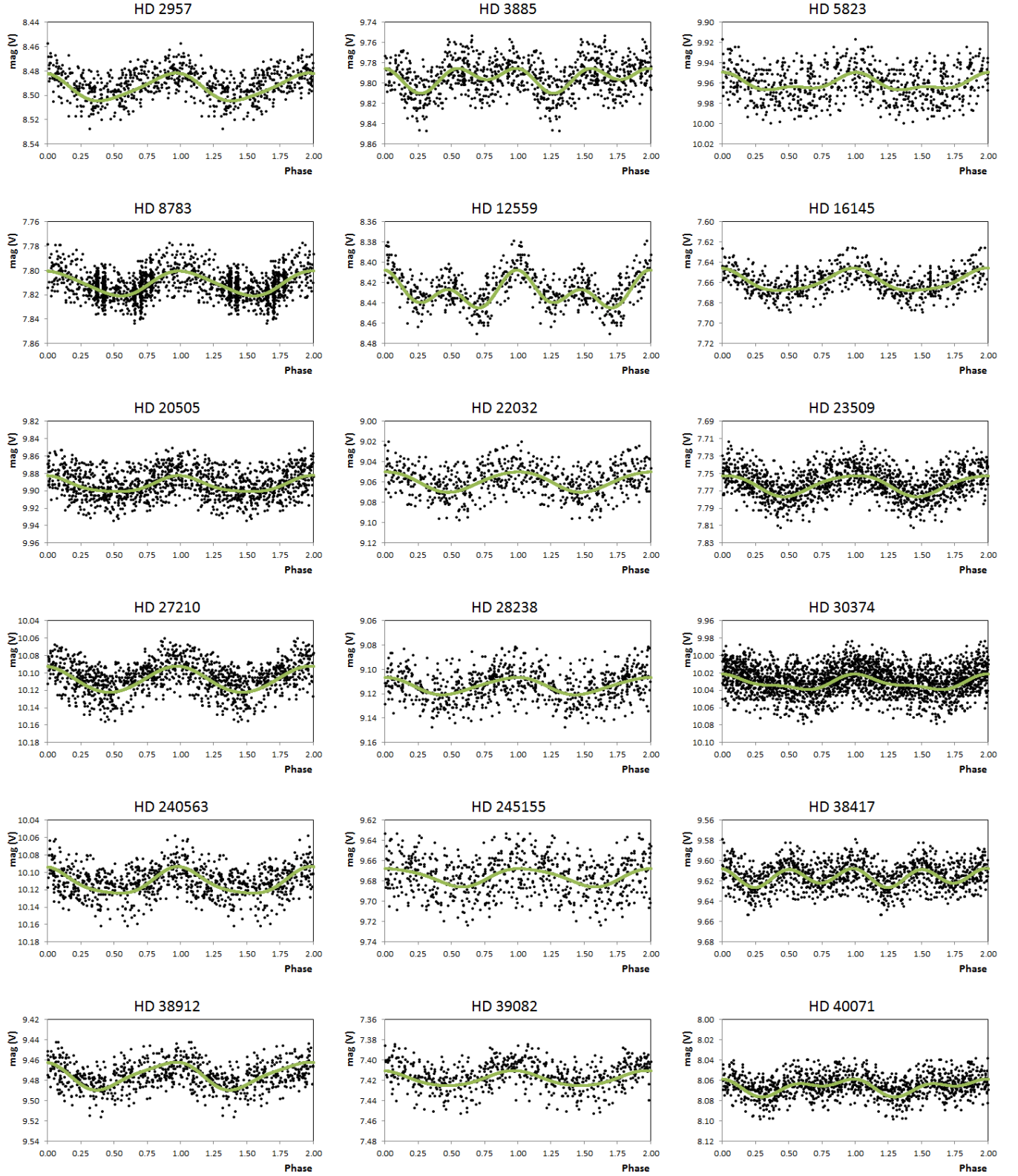
Table 3. continued.

Star	Var. desig. Literature	Var. type Literature	Period (d) Literature	Period (d) This work	Reference	Remarks/comments Literature
HD 106204 BD+01 2668 HD 109300 HD 110072	NSV 19303	VAR		4.3572(3) 0.98410(1) 2.63189(9) 22.225(6)	Rufener & Bartholdi (1982)	* * Null result for roAp pulsations (e.g. Martinez & Kurtz 1994). $v \sin i = 3.3 \pm 0.5$ ; $T_{\text{eff}} = 7300$ K; double-lined binary with peculiar lines of e.g. Nd, Pr and Eu (Freyhammer et al. 2008a).
HD 110274  HD 110568 HD 115398 HD 115226	ASAS J124131-5855.4	MISC	265.3 (Freyhammer et al. 2008b) 310.0 (Sitek & Pojmański 2014)	265.1(4)  9.6018(9) 0.720460(7)	Freyhammer et al. (2008b)	  * *
HD 115226		roAp	10.86 min (Kochukhov et al. 2008)	2.9882(1)	Kochukhov et al. (2008)	Kochukhov et al. (2008) find $v_e \sin i = 25\text{-}30$ km/s and $P_{\text{rot}} \leq 3.0\text{-}3.5$ d. Surface abundance inhomogeneities established. No variability found in ASAS data but marginal variability with $P = 3.61$ d in Hipparcos data.
HD 115440 HD 117096 HD 117692 HD 121142				5.4421(4) 2.12428(6) 3.2798(1) 1.69062(3)		Null result for roAp pulsations (Martinez & Kurtz 1994). * * *
HD 121661	ASAS J135842-6243.1	MISC	47.0 (Freyhammer et al. 2008b) 46.850 (Sitek & Pojmański 2014)	46.86(2)	Freyhammer et al. (2008b)	Null results for roAp pulsations (Martinez & Kurtz 1994).
HD 121841 HD 122983 HD 123164 HD 124455		ACV	$3.4 < P < 3.8$ (Paunzen et al. 2011)	1.08529(2) 3.6166(2) 2.51961(8) 0.606079(5)	Paunzen et al. (2011)	*  Null results for roAp pulsations (Martinez & Kurtz 1994). *
HD 124437 HD 127924 HD 129934 HD 130382	HIP 69725	VAR ACV	0.828705 (R12) 3.55 (Paunzen et al. 2011)	5.9563(4) 3.5487(2) 2.17566(6) 1.66901(3)	R12 Paunzen et al. (2011)	R12: BE+GCAS/DSCT (prob: 0.23/0.59) * * *
HD 131505A HD 133428	HIP 74294	VAR	1.258 (RM09) 0.758752 (R12)	1.25794(2) 1.51763(3)	R12	R12: DSCTC/DSCT (prob: 0.24/0.24)
	ASAS J151109-7657.0	EC/ACV/ESD	1.51765 (Sitek & Pojmański 2014)			
HD 136357 HD 137309 HD 139149 HD 140532				1.92479(5) 2.19247(6) 1.64538(3) 1.07077(1)		* * * *
HD 144748 HD 144264A CD-28 12149 HD 149228		ACV:	3.9815 (W12)	4.9549(3) 1.25143(2) 1.35884(2) 1.54043(3)	W12	blend?, weak signal (W12). * Constant or probably constant (W12). Constant or probably constant (W12).
HD 149334 HD 149769	ASAS J163524-3400.8	EA	3.5444 (Sitek & Pojmański 2014)	3.54420(6) 8.2422(8)	Sitek & Pojmański (2014)	Null result for roAp pulsations (Martinez & Kurtz 1994).
HD 150323 HD 155188 HD 158450 HD 167476	NSV 20737  NSV 22273	VAR  VAR		5.3777(4) 3.3334(2) 8.5239(8) 3.2895(1)	Vogt & Faundez (1979)  Vogt & Faundez (1979)	 Null result for roAp pulsations (Martinez & Kurtz 1994). Null result for roAp pulsations (Martinez & Kurtz 1994). *
HD 170054	NSV 24444	VAR	1.043999 (R12)	0.97317(1)	Hrivnak (1977)	Blue straggler according to Hrivnak (1977); R12: BE+GCAS/SPB (prob: 0.27/0.48)
HD 169789 HD 170836 HD 170860A		ACV ACV	0.9? (Paunzen et al. 2011) "variable" (Paunzen et al. 2011)	5.2315(4) 19.516(5) 1.38585(2)	Paunzen et al. (2011) Paunzen et al. (2011)	*  *



**Table 3.** continued.

Star	Var. desig.	Var. type	Period (d)		Reference	Remarks/comments
	Literature	Literature	Literature	This work		Literature
HD 173657	HIP 92215	VAR	1.93720 (VSX)	1.93789(5)	<a href="#">Koen &amp; Eyer (2002)</a>	
HD 173361				0.831981(9)		*
HD 181549				22.871(6)		*
HD 193325				3.1529(1)		
HD 198918	NP Del	ELL:	0.777813 (VSX); 0.388866 ( <a href="#">Dubath et al. 2011</a> )	0.777809(7)	<a href="#">van Leeuwen et al. (1997)</a>	
HD 200199				1.03512(1)		*
HD 205013	NSV 25655	VAR	1.57594 (VSX)	1.57624(3)	<a href="#">Kornilov et al. (1991)</a>	
HD 209605A				7.8132(7)		Null result for roAp pulsations ( <a href="#">Martinez &amp; Kurtz 1994</a> ).



**Figure 8.** The light curves of all objects, folded with the periods listed in Table 2. The fit curves corresponding to the light curve parameters given in Table 2 are indicated by the solid lines. The complete figure is available from the authors.